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CINCINNATI, OHIO VOL. 1, NO. 5

FEBRUARY, 1937

Plating Important Factor in Merchandising of Modern Automobile

Plating department in Pontiac automobile plant, described in this article, is one of the most efficient and complete in the automobile industry.

BY E. E. WIDDIS
Supt. of Plating, Pontiac Motor Division, G. M. C.

THERE is perhaps no mechanical product which is more dependent upon appearance for successful merchandising than the automobile. Appearance has always been an important factor, due to the fact that the automobile is so much the modern family carriage. The constant evolution of the operating parts towards

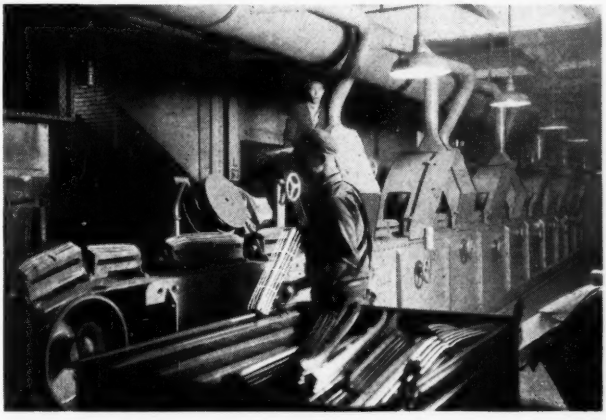

Fig. 1—Radiator grilles for Pontiac automobiles are polished in an automatic polishing machine.

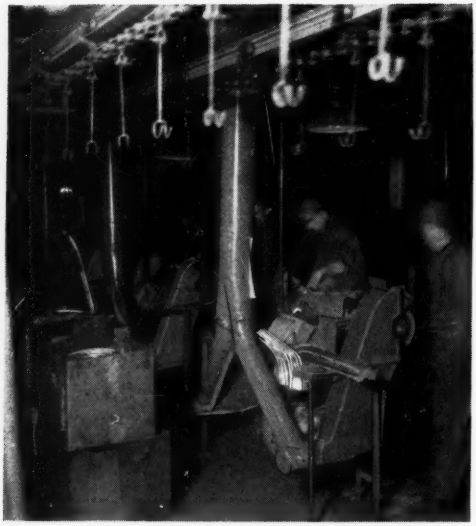

Fig. 2—The curved ends of the grilles are polished by hand.

perfection has tended to eliminate necessity for concern regarding mechanical design and has increased the importance of the appearance factor in direct proportion.

Always an infallible index to quality, insofar as appointments were concerned, plating has come into its own during the past few years and is now found not only on lamps and door handles, but also on hub caps, instrument boards, bumpers, windshield frames, radiator grilles, and many other places where the bright lustre of chrome and nickel can be used to add a note of distinction.

The constantly widening use of plating has compelled the development of plating equipment which could compare, for efficiency, with the production equipment for which the modern automobile plant is noted. And American automobile plants, as everyone knows, lead the world in mechanical efficiency.

An excellent example of production plating equipment is found in the plant of the Pontiac Motor Company, Pontiac, Michigan. The most important of the parts that pass through this department, are, of course, the radiator grilles, which play so important a part in the appearance of the car. Radiator grilles are made from steel and are finished by chrome

Fig. 3—One end of the plating department. Ten grilles at a time are lowered into the tank.

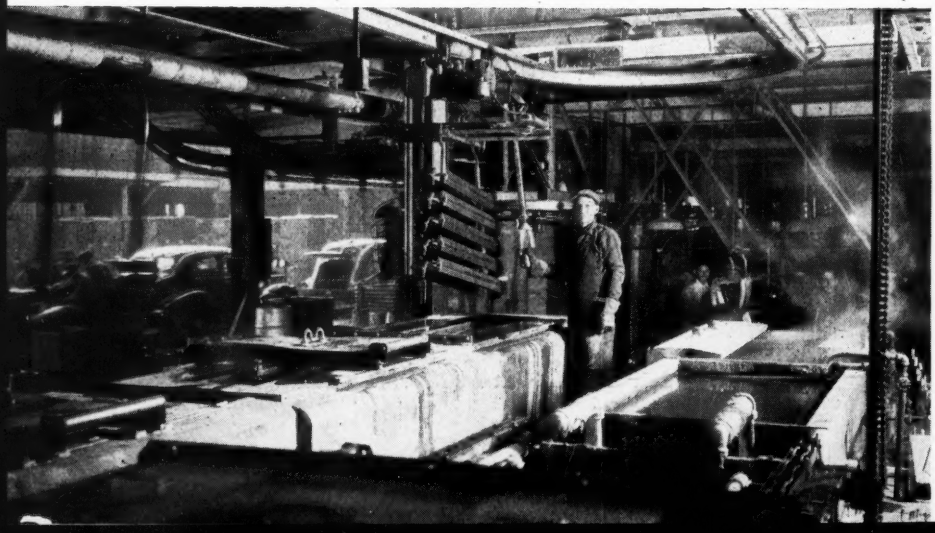

Fig. 4—The monorail conveyor extends the full length of the department over each line of tanks.

plating with lacquer applied between the bars by a method which will be described later in the article.

In order to obtain the smooth surfaces on the grilles which are necessary before these parts can be plated, the grilles are first polished in an automatic polishing machine which is illustrated in Fig. 1. Each grille is placed on a specially designed fixture on the automatic conveyor and is passed successively under six sets of polishing wheels. Inasmuch as the design of the grille is somewhat V shaped, wheels are so located that alternate wheels polish opposite faces of the grille. Each set of wheels removes 0.0005 to 0.001 in. of stock. and the grille emerges from the end of the machine with the flat surfaces perfectly smooth and ready for plating.

One end of the grille is curved, however, and inasmuch as this curve cannot be efficiently reached by the wheels in the automatic machine, it has to be polished by hand. This operation is shown in process in Fig. 2. Upon leaving this operation, the grilles are hung in lots of ten on racks which transport them to the various tanks in the plating department.

Figure 3 shows a rack carrying ten grilles in position for lowering into the cleaning tank, which is the first operation in the plating sequence. The cleaning tank is of a size which will accommodate one load or rack full of grilles, but the caustic cleaning solution in the tank is pumped in from

Fig. 5 — Inspection table. Four 100 watt lamps, shining through a frosted glass, provides an even brilliance which shows up the slightest defect.

a 4000 gal. tank of solution in the basement under this department. Two pumps are constantly at work, pumping 200 gal. of solution per minute into the cleaning tank shown, which cleans the work preparatory to copper plating, and into another tank which cleans it again preparatory to nickel plating. The work rests in this tank two minutes and is then raised and moved on to be lowered into a second cleaning tank containing a caustic solution at 188 deg. F. This is an electrolytic cleaning bath, the work comprising the cathode and the current passing from the anodes which are attached to the sides of the tank to the work. In the resulting chemical action, the evolution of the gases on the surface of the work tends to loosen all foreign matter and thus leave the work clean. The work is held in this tank for two minutes and is then removed and given an acid dip and water rinse in quick sequence.

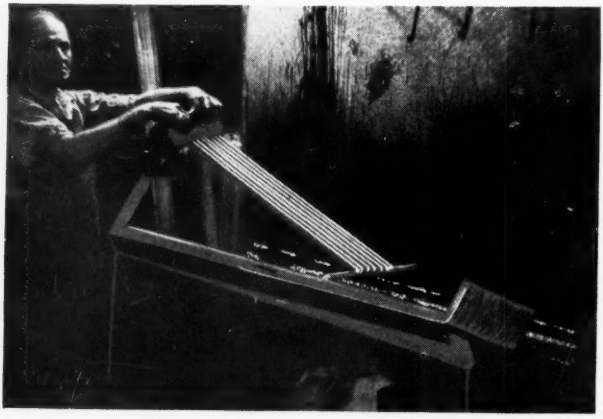

Fig. 6—Each grille is dipped in lacquer, then the polished front of the grille is wiped clean, leaving the lacquer on the sides of the sections.

In the next tank the work is given a copper plate for twenty minutes. The copper plate is then buffed in preparation for nickel plating on automatic buffing machines.

Upon re-entering the plating department, the work is given a copper strike preparatory to nickel plating and is then immersed in the nickel plating bath in which it remains for 30 minutes. The solution in this bath is maintained at a temperature of 135 deg. F. After leaving the nickel bath, the grilles are again rinsed in a hot water bath and are then conveyed to the buffing department again where they are hand buffed preparatory to chrome plating. After buffing, the grilles are hung on the conveyor that carries them to the chrome plating tanks at the far end of the department. In the first operation in the chrome plating department the grilles are immersed in an electric caustic soda cleaning bath which removes all dust, grease and other foreign matter. They are then passed successively into a cold rinse, acid dip, cold rinse and then into the chrome plating tanks. The chrome plating operation takes only two minutes, during which a layer of chrome 0.000025 in. thick is applied. The total thickness of the plate, including the copper, nickel and chrome, is now **0.001 inch.**

After the final plate is applied, each grille is carefully inspected to make sure that it comes up to the engineering specifications. The illustration Fig. 5 shows an inspection bench built with a compartment at the top which houses four 100-watt lamps. A frosted glass underneath the lamps diffuses

(*Continued on Page 16*)

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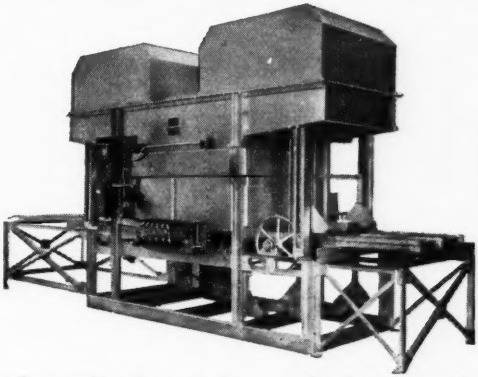

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Corrosion Problems

In this article the author discusses the mechanism of corrosion rate and its evaluation, and the factors which influence the corrosion rate

By George M. Enos
Assistant Professor of Metallurgy, University of Cincinnati

ALL of us will at some time encounter a specific corrosion problem. We are all producers, fabricators, or users of metals, and because all metals and alloys tend to corrode, and most of them do corrode under certain common conditions, we can be certain that some phase of the general corrosion problem will come to our attention eventually. We know that corrosion of metals and alloys represents a huge waste, the monetary value of which cannot be accurately evaluated. Undoubtedly the annual loss to the world amounts to billions of dollars, for when a structure or object becomes worthless due to corrosion, the loss involved is not only the value of the metal, but also represents the labor involved in fabrication, and the loss of use of the article.

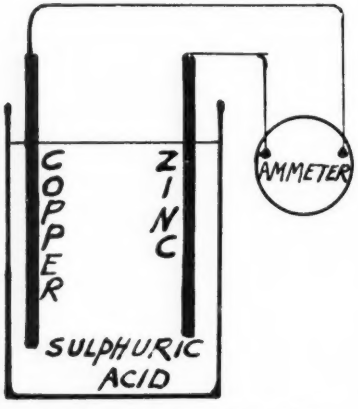


Fig. 1—Diagram of a Daniell's cell illustrating the corrosion of the anode. The energy involved in corrosion is liberated as an electric current.

In many cases the actual loss of metal due to corrosion is very slight, yet the monetary loss may be appreciable. Suppose some sheet steel is in process of fabrication, and a film of rust forms over night. This film of rust is insufficient to cause any loss of strength in the metal, but production is delayed while it is removed, because some coating, intended to protect, or beautify, or both, cannot be applied on a rusty surface. If it is applied, apparently successfully, the coating may loosen later, and cause dissatisfaction to the ultimate user, which may lead to loss of other sales.

In brief, corrosion problems are serious problems, not only because of actual loss of metal, large scale deterioration of structures, disastrous failures, and the like, but are also serious because slight corrosion may spoil the appearance of a metal product, or may increase the number of steps in fabrication and finishing processes because of the necessity of removing slight amounts of corrosion products.

So far "corrosion" has not been defined, nor is it easy to formulate an adequate definition in simple language. One of the chemical characteristics of metals is their tendency to react with water, oxygen, carbon dioxide, and with other simple reagents to form

compounds which are stable. For example, iron has a strong tendency to react with water and oxygen to form rust, whereas the rust, once formed does not react with water and oxygen, that is, it is **stable** with respect to these reagents. Further, if the oxygen and water are removed, and some other environment substituted, it will require very special conditions (for example, high temperature and carbon) to produce iron. Any other change in conditions, as for instance, adding hydrochloric acid, will simply tend to change the iron compound to another compound which is **stable** under the new conditions.

This tendency to react chemically with the simple reagents everywhere available, such as water, oxygen, and carbon dioxide, is much more marked in some metals than in others. Gold and platinum have so little tendency to react with common reagents that it can be said they do not corrode under ordinary conditions.

Since any process of corroding a metal results in the formation of a chemical compound, the simplest possible definition of corrosion is that it is a process of oxidation of a metal (or alloy), the term "oxidation" being used here in the chemical sense, meaning that the metal **combines** with one or more other elements, usually non-metals, to become a compound, and thus lose its identity and characteristics as a metal. If we are considering some specific case, it is obvious that the metal object need not lose much weight or change much in dimensions, as long as the reaction is localized on the original surfaces, but **some** of the metal must react chemically for corrosion to take place, and hence there must be some change in weight and in dimensions.

We usually think of corrosion as a thing to be avoided, but it should be pointed out that it is often a useful process. Lead is corroded to make "white lead". Aluminum is corroded by anodic oxidation to protect against further corrosion, and to prepare its surface for painting or dyeing. Other examples of useful corrosion could be cited.

Mechanism of Corrosion Processes

There have been many attempts made to explain in detail the mechanisms of corrosion processes. It is unnecessary to review theories which explain only a few of the observed phenomena. It is possible to corrode some metals, especially at high temperatures, with oxygen, or some other active gas, with no water present. However, most cases of corrosion involve moist atmospheres or aqueous solutions, and under these conditions the electrolytic theory of Whitney affords ample explanation. A brief statement of this theory follows:

Fig. 2—The rusting of the steel should be accelerated at the junction with the brass, as steel will be the anode. It will rust anyway. The brass might also corrode, but at the joint the steel will protect the brass.

Water is an electrolyte, and ionizes to form some hydrogen and some hydroxyl ions. In any electrolyte, when a metal atom goes into solution it assumes one or more positive charges of electricity. The tendency for any metal to dissolve in an electrolyte can be measured quantitatively in electrical units, and, for comparable conditions, the relative tendencies of metals to dissolve, (form compounds in solution) can be evaluated. Since the solution of the metal involves an electrical change, and in special conditions the useful generation of the electric current, the general mechanism is called "electroly-

tic". As an example:

$$Fe^{\circ} + 2H^{+}OH^{-} \rightarrow Fe^{++}(OH)_2^{=} + H_2$$

or, iron displaces hydrogen in water forming ferrous hydroxide and liberating hydrogen gas. The iron is said to be oxidized. In passing it may be noted that "rust", the product formed when iron is corroded by the usual agents of nature, is not necessarily a single chemical compound, but usually

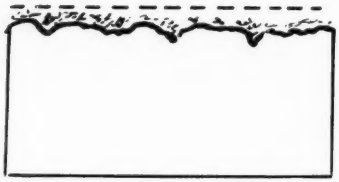


Fig. 3—Sketch showing rusting on steel, a cross section view. Dotted line indicates original surface. Rust forms on surface. The pits formed are due to cell action, where differences in structure cause an anode-cathode relationship to exist.

consists of oxides, hydroxides, and carbonates in various proportions. Another example,

$$Zn^{\circ} + H_2^{++}SO_4^{=} \rightarrow Zn^{++}SO_4^{=} + H_2$$

or zinc is corroded by sulphuric acid in water solution forming zinc sulphate and liberating hydrogen.

The energy changes in the foregoing reaction results in the liberation of heat. Both reactions are in accordance with the electrolytic theory of corrosion since an electrolyte is involved. The energy involved in corrosion may be usefully liberated as an electric current. Thus if two metals, say zinc and copper, are immersed in sulphuric acid, as shown in Fig. 1, and are externally connected, the zinc will be the anode, it will be corroded, a current will flow through the external circuit, and this current can be measured by the ammeter. This latter example is very important, for the principles involved will aid in an understanding of many localized cases of corrosion.

It was previously stated that the tendency of metals to corrode could be evaluated numerically. When all the metals are so evaluated they form what is known as the "electromotive force series" of metals. Useful information can be obtained from this series in predicting which metal will be anode, and thus corroded, if a pair of metals are in electrical contact in an electrolyte. (The electrolyte may be as simple a one as moist air). Omitting from the list many of the less common metals, and arranging the metals in order of decreasing tendency to react, and also omitting the numerical values we find the series to be as follows:

E. M. F. Series of Metals

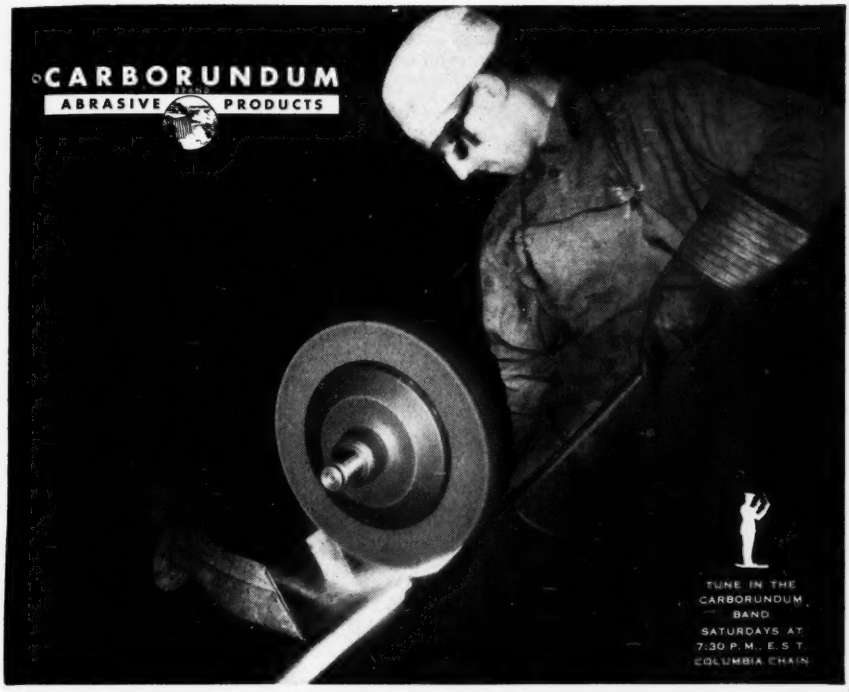
Potassium
Sodium
Magnesium
Aluminum
Zinc
Chromium
Cadmium
Iron
Cobalt
Nickel
Tin
Lead
Hydrogen
Copper
Mercury
Silver
Platinum
Gold

In making use of this series there are several important facts to remember.

1. Any metal will replace any other metal which is below it in the series from a solution of its salts, for example, iron placed in copper sulphate will go into solution as iron sulphate and copper will come out of solution as copper.

2. When two metals are electrically connected, that is in direct contact, or connected by a suitable conductor and placed in an electrolyte, the metal higher in the series will become the anode, and will be corroded with the liberation of electrical energy. (This energy may be converted to heat energy and dissipated.)

3. The cell formed under the conditions just mentioned may soon become "short circuited" due to accumulation of corrosion products, and fail



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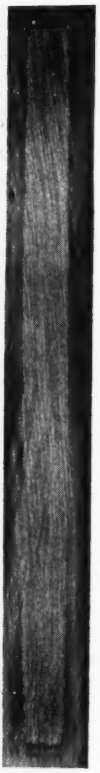

Fig. 4—Cross section of manganese brass uniformly corroded in mine water. The dark areas indicate the depth of corrosion product. Corrosion rate on weight basis is moderate.

to function efficiently as an electrolytic cell.

4. The c.m.f. series does not give any reliable evidence as to the anode-cathode relationships which may exist between different alloys when placed in electrolytes under conditions where cell action could occur.

In connection with the last statement, a rough grouping of metals and alloys may be made in a manner similar to the c.m.f. series of pure metals, and within any group, any anodecathode relationships which might be assumed will not, in general, cause serious corrosion of the anode. However, if a metal or alloy of one group is in electrical contact with a member of a group lower in the series, the first metal or alloy will become the anode, if cell conditions are assumed.

Groups

1. Magnesium and active aluminum.
2. Zinc, cadmium, zinc alloys.
3. Iron, steel, alloy steels with low chromium, low nickel, or low nickel chromium content. Aluminum alloys and passive aluminum.
4. Tin, lead, and ordinary solders.
5. Stainless iron and steels, (12 per cent chromium range).
6. Nickel, brass, bronze, monel metal, copper.
7. Very high chromium contest alloy steels, "18-8" stainless steel, and related alloys.
8. Silver solder.
9. Silver, gold, platinum.

Thus if plain carbon steel is directly in contact with any type of stainless steel or iron, the plain carbon steel will become the anode and corrode, if a suitable electrolyte is present, but if any stainless iron or steel were electrically connected to silver under cell conditions, the stainless iron or steel would become the anode and corrode. Since some of the terms used are rather general in meaning (aluminum alloys, brass, and so on) too much reliance cannot be placed on this grouping, for many exceptions might occur. Further, in many alloys the micro-constituents themselves may take on anode-cathode relationships and localized corrosion occur in the alloy even though it is attached to some other material of such position in the grouping that corrosion would not be predicted.

Corrosion Rate and its Evaluation

It is usually very unwise to state that one metal will corrode faster than another, unless the statement is qualified by a complete statement of all the conditions of test. Further, the fact that one metal does corrode faster than another under a specific set of conditions often gives no information as to what could be expected under another set of conditions. The technical literature is full of reports of corrosion tests on various metals and alloys, with corrosion rates stated. It requires a great deal of care and judgment to decide whether information given in any report is reliable, and whether it is applicable to a apparently closely related problem.

In general the term "corrosion rate" is taken to mean that, under the conditions of test there has been a certain loss in weight, per unit of (orig-

inal) exposed area, per unit of time. Corrosion tests reported in this manner may be reported in such terms as "loss in weight in milligrams per square decimeter per month", or in "loss in weight in avoirdupois oz. per sq. ft. per year", or in other combinations of units. Thus if several reports of different investigators are to be compared it is frequently necessary to recompute results into a common basis of measurement.

Reporting corrosion rate in the manner indicated is of little value unless full details of corrosion characteristics are given. Thus if a test piece is corroded uniformly with no pitting, the loss in weight measurements are quite significant, but if pitting occurs, the loss in weight measurements have less significance and the number of pits per unit of area and their maximum and average depths should be reported. These points, illustrated in Figs. 4. and 5., are photomacrographs of two materials which were tested in acid mine water. The manganese brass had a relatively high corrosion rate on a weight basis but no pitting occurred. The aluminum alloy had a low corrosion loss on a weight basis but pitted through in a very short time period.

Factors Which Influence the Corrosion Rate.

The factors which influence the corrosion rate have been stated elsewhere by the author as follows:

1. The physical condition of the metal or alloy.
2. The chemical composition of the metal or alloy.
3. The chemical composition of the corroding medium.
4. The physical constitution of the corroding medium.
5. The velocity of the corroding medium, or of the metal in the medium.
6. Temperature.
7. Time period of exposure.
8. Solution pressure of the metal or alloy.

There are several minor factors which occasionally may have some slight bearing on the corrosion rate. The limitations on this article preclude an extended discussion and illustration of the factors listed, but brief mention will be made of some of the important points. "Corrosion rate" as used here refers both to even corrosion and to pitting phenomena.

Fig. 5—Photomacrograph illustrating pitting in an aluminum alloy. Weight loss indicates low rate of corrosion, but pits rendered material worthless for structural use in short time.

It is well known that the physical condition of the metal may have an important bearing on the rate of failure. Thus, in general, stainless steel should be properly polished before service. "Physical condition" is a general enough term to include the stress conditions in the metal. Sometimes a failure in a metal that is high-stressed may be accelerated by corrosive conditions as in "season cracking", or in fatigue failures.

Needless to say the chemical composition of the metal or alloy and the chemical composition of the corroding medium are most important factors, and these, of course, are related to the "solution pressure" or position of the metal in the e.m.f. series. The chemical composition of the metal also is important with regard to the type of corrosion product which will be formed, and this product may protect the underlying metal, so that there may be a high initial rate of corrosion, which will be decreased as the coating of corrosion product is formed. Thus the time factor becomes important, and, with further respect to the corrosion product formed, the amount of material carried in suspension in a solution, and the velocity of the solution will have a bearing on whether the corrosion product remains in place, (oftentimes to protect the metal, partially,) or is abraded or washed away, thus exposing a fresh surface of metal.

The material incorporated in this article has been drawn from so many sources, including personal experience, that no attempt has been made to list references. Speller's book, Corrosion—Causes and Prevention, McGraw-Hill Book Co., which contains an excellent bibliography, should be consulted by those interested in a more exhaustive treatise on the subject.

Plating Important Factor

(*Continued from Page 8*)

the light so as to afford an even brilliancy under which any possible defect in the work can be quickly discovered.

Having passed inspection, the grilles are moved on to a series of lacquer tanks in which the center grilles and side grilles are dipped. The dipping process, of course, covers the grille completely with a coat of lacquer, but the front surface of each grill is immediately wiped clean, leaving the lacquer only on the sides and back of the fins. This operation is shown in Fig. 6. To make sure that all lacquer will be removed from the surface, the soft rag that is used for wiping is first dipped in thinner which not only removes the lacquer but also acts as a cleaner.

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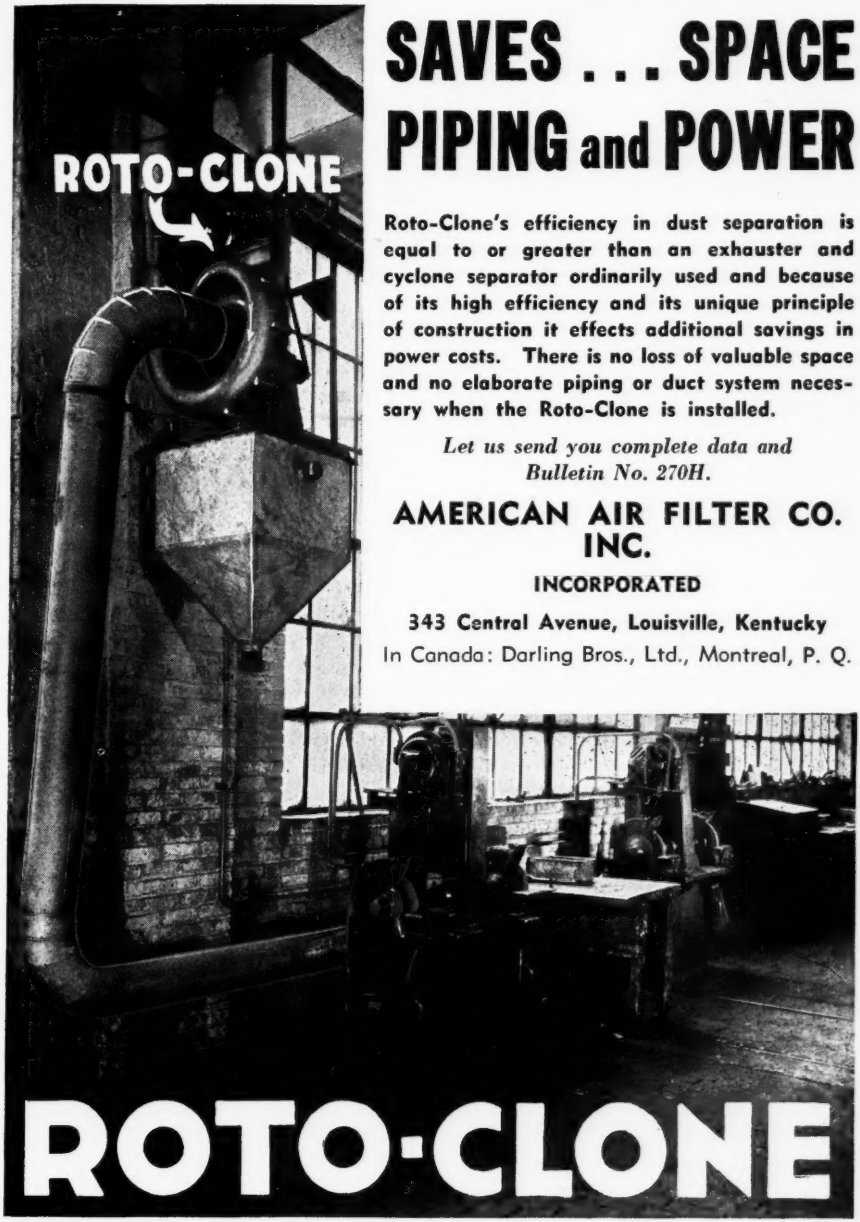

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By H. Leroy Beaver

NO MORE appropriate time than the month of February, 1937 could be selected for the beginning of a series of papers on the subject of The Barrel Finishing of Metal Products, for it marks the one hundredth anniversary of the attempted experimental practice of the art in the United States.

We are told by Mr. Albert Pott of the Baird Machine Company that their records disclose that Mr. Baird, the founder of their company, while connected with Scovill Manufacturing Company in 1837, experimented with varous instrumentalities in an effort to develop a process for the mass finishing of small metal parts. Even in these early days wine casks and various other types of barrels and kegs were plentiful, but the results secured from their use, considering that only the parts themselves were operated upon without any admixture of metallic burnishing materials, produced only mediocre results. Eventually Baird, after many years of experimenting, followed in the later years by other executives of the Baird Company, developed what we know as the present day Baird Burnishing Machine. The barrel of this machine is of the long and narrow type and in the course of these papers will be designated as the Type "B" Machine. The final development of this machine dates from about the year 1907.

There may have been and undoubtedly were other experiments by many persons, unrecorded however, between the earlier attempts of Baird and the next published record. Mr. George B. Hogaboom has very generously translated for the writer from his original copy of Rossilieur, from the French, an account of an attempt to mass-finish small metal articles by revolving them in a metal drum turned by a hand crank much in the fashion of an ancient peanut roaster, and that even before this time, articles were tumbled back and forth in a goatskin bag along with small pebbles and wood chips. This record bears the date of 1850.

Diligent search of all available records discloses little or nothing pertinent to the subject until about the year 1885 when Edmunds, in England, after various experiments, produced an oscillating type of burnishing barrel and it is from the experimental work of Edmunds that our present-day barrel burnishing practice has been developed. As the story comes to us, Edmunds' conception of the process was gained by observing the operating of a revolving oscillating cylindrical screen drum, used in a trap rock operating for separating crushed stone into various market sizes. He was impressed with the brightly pol-

ished interior surface of the screen cylinder, and he probably reasoned that, if a screen could be so polished of itself, why would not metallic articles, when placed in a revolving drum or barrel also take on a polish or finish at least equal to that produced on the inner side of the revolving drum or screen.

There is a slight conflict as to the date of the first commercial application of barrel finishing in the United States. We do know definitely that, in 1901, Edward L. Ashley operated an Edmunds type of machine in the plant of Scovill Manufacturing Company, and that following this he developed various other and conventional types of barrels used in the manufacturing processes of that Company.

In 1908, The Imperial Seamless Wire Company of Providence, R. I., purchased eight of the Edmunds Burnish-Machines in Birmingham, England. The first two of these machines were received in Providence in September 1903, set up and placed in operation, and manufacturers of metal products were invited to submit samples for demonstration. The Edmunds machine was of the small diameter, long type with trunnions mounted off-center to produce the oscillating motion. Future reference to this type of barrel will be as of Type "E". We here note, however, that for the most part the claims made for the oscillating type of barrel cannot be substantiated, and barrels of this type are now practically obsolete.

Our next reference brings us to the Barton brothers, Henry and Everett. Early in 1904 they devised a twin cylinder burnishing machine comprising two small hexagonal barrels which were carried in a rack that revolved in a wooden trough filled about half full of soapy water. Their first compartments were fitted with transverse ribs on the inner barrel surfaces to, as Everett Bartin explained to the writer, "stir up the balls and jewelry". This Barton origination, with only small changes in detail later became very popular in the jewelry manufacturing field. For want, perhaps, of a more appropriate name, it has for years been designated as a "tubbing machine". Its present-day development is found in the Smith-Richardson Tubbing Machine. Future reference to this type of burnishing machine will be as of Type "T".

In March of 1908 one Curtis E. Hodgkins developed an oscillating type of burnishing barrel on which he received a United States Patent. This machine was also designed for the purpose of polishing jewelry, but there is no record of the machine ever having passed the patent stage or ever having been placed in production or offered to the metal trades.

In 1910, George E. Abbott, after a vast expenditure of time and money in experimental work, developed the first large diameter and narrow type of burnishing barrel on which there was issued a United States Patent. Preceding this he had developed two other barrels of somewhat similar design, both of which he later rejected, and his patent covers the present day Abbott Burnishing Barrel. They will hereinafter be designated as Type "A". We needs must pause here to pay a richly deserved tribute to George E. Abbott. The writer knew him intimately and well throughout all of the years of his business life, and no one better knows of the years of time, effort and money he expended in researches to develop the most satisfactory methods for mass production finishing by the barrel method.

In 1912 one Winslow Parsons sought to secure a patent, claiming as his exclusive right the conception of metal finishing by the barrel method, in both a cutting down and polishing process.

His claims to priority of practice of the art could not, of course, be substantiated, and he was never known to have manufactured or sold any equipment for the carrying out of the process.

In June, 1913, on application of one Jean Ubersax of Delemont, Switzerland, there was issued a United States Patent covering a process for the burnishing of silver utensils. His machine for carrying out this process—known as the Tahara Automatic Silver Burnishing Machine—is technically and from a proportional point of view, as respects size of barrel, amount of burnishing material to parts being burnished, barrel speeds and scientific operation, the highest development in barrel finishing today. Unfortunately this type of barrel has never been developed or adapted to commercial use generally, except in the hotel and restaurant field, even though its applications would be legion. It will be hereinafter referred to as Type "U".

About 1931, and perhaps before that time, Thomas A. DeVilbiss conducted a great many experiments on both barrels and burnishing materials. His conception of burnishing barrels leaned toward the oscillating type. Barrels of his design are now available, but it is to be regretted that DeVilbiss did not give the metal finishing trades published data of at least a part of his research work.

About the same time Henderson Brothers of Waterbury, Conn., introduced various types of barrels for burnishing work. We like to think of Henderson Brothers as perhaps the only "made to order" burnishing barrel plant in the country. While they regularly manufacture several types of barrels, they also develop any type according to customer specifications.

Since 1913 practically nothing of importance has been developed in barrel burnishing machines. The long and narrow type and the high and narrow type as championed by Baird and Abbott respectively, the Barton Tubbing Machine Type as exemplified in the Smith-Richardson and the one-third-lid-opening type of Jean Uebersax, constitute the obtainable types of burnishing machines available to the American Manufacturer.

True, other American Manufacturers, aside from the originators produce burnishing barrel equipment, and dividing the sources of supply by types, we would find at least the following to some extent known barrels:

A—Abbott, Globe.

B—Baird, Crown, Belke, Lustre, La-Salco, L'Hommodieu, Mercil, Henderson.

T—Smith-Rich., Boland, Leiman, Lupomatic.

U—Uebersax, Tahara, Sterling, Lupomatic, Lustrebright, Silberbright, Henderson.

E—Edmunds, DeVilbiss, Abbott.

Crediting the first named under the respective headings as the original, the succeeding barrels in each respective type represent little more than copies of the originals with minor variations respecting method of barrel support, drive and lid assembly, none of which are of importance or bearing directly on the carrying out of the process. At least three of the later Type "B" machines claim successful operation, at various angles which would only approximate the action to be secured in what we know as oblique tilting tumbling barrels. These will be dealt with in a subsequent paper.

It is to be regretted that some of the later manufacturers have not exhibited more originality in barrel design and variation in size. There are surely other types of barrels that have most important applications in our industries today. For example,

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in much of our research work we have used a barrel 17 inches in diameter and 24 inches long containing 420 pounds of metallic burnishing material which fills the barrel two-thirds full. In the beginning, or about 22 years ago, this barrel was fitted with plate glass ends and in its operation, at various speeds and under varying conditions, we have learned much concerning the application of the process. There is a nicety of proportion in burnishing barrels which seems to have escaped most of the later barrel manufacturers, because in subsequent designs the dimensions are practically the same as in the originals. One would think that other size combinations would at least have been tried in an effort to improve on the proportions of the originals.

Most of the present day burnishing barrels are composed of cast iron shells lined preferably with hard maple. It is impossible to form a water tight joint with these sectional liners and so water seepage between the wood liners and the barrel shell sets up a continuous flow of iron oxide or rust which seeps into the barrel itself. One of the greatest single improvements we could suggest to barrel manufacturers is to have their cast iron barrel shells galvanized before final assembly. After the wood lining is set in place, this type of barrel is practically rust-proof. The process is entirely practical and we have one 8x12-inch barrel treated in this way that, after six years of almost continuous use, shows no disintegration of the galvanized surface. This barrel has already had at least fifteen sets of ⅜-inch new maple liners, and we have never noted even a trace of iron oxide stains on any work operated in this barrel.

One of the major difficulties in barrel burnishing practice until recent years, was the reloading of the steel burnishing material after completion of a run a prodigious waste of production, time and man power. However, at least one manufacturer has now placed on the market an end loading Star Return mill into which work can be loaded by means of a power loader. When the burnishing operation is completed, the reversal of the direction of rotation automatically separates the tumbling material from the work, and then discharges the work. The tumbling material is then returned automatically to the tumbling compartment for the next patch of work.

In the past 27 years we believe we have worked with every type of burnishing barrel. There is still plenty of opportunity for the display of originality in devices for the carrying out of the process. Even though we have discussed the importance of other sizes and types of barrels with present day manufacturers, the tendency still seems to be to "follow the leader".

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The Finishing and Polishing of Stainless Steel Sheets

Manufacturers are now buying unfinished cold rolled stainless steel sheets and finishing them in their own plants. In this article the author gives suggestions regarding equipment, and tells how the equipment is used.

By Edgar Schellenbach
The American Rolling Mill Company, Middletown, Ohio

BORN with a figurative silver spoon in its mouth and reared as a pampered pet, stainless steel is growing from adolescence into robust young manhood. Its undenied atmosphere of aristocracy remains—but, there is a growing new factor of great significance. Manufacturers and fabricators are finding ways and means to slice finishing costs of this champagne of ferrous metals.

Not so many years ago, producers threw up their hands in despair when they figured the costs of their products in terms of stainless steel as the raw material. It was a luxury among the non-precious metals. The manufacturer who used it on his products used it sparingly. Just a touch of it here and there to serve as special trim —something to set his product apart from others.

Today, stainless steel is cracking new markets. In fact, there aren't many places where stainless hasn't made a triumphal entry. First it was admitted only to the social register of finished products; now it is going democratic in a big way.

Has the bottom dropped out of the cost of stainless steels to account for a tremendous boost in sales?

Definitely, no. Prices have steadily dropped from the dollar a pound or more of the early days, but the alloying elements in stainless haven't been changed, nor can they be sacrificed for substitutes to effect a saving in cost in this direction. They're necessary ingredients in a metal that will last a life-time under ordinary usage.

The answer to present lower finishing costs lies in **new cold rolling methods that make it possible for fabricators to buy unpolished stainless steels of the best quality and then do their own finishing and polishing.**

In other words, new cold reduction mills have resulted in such great improvements in the surface qualities that manufacturers and fabricators can buy ordinary cold rolled stainless and do their own polishing and finishing at half of former polishing cost. These new developments in cold rolled quality have been made available to stainless sheet users only during the last year.

For instance, Armco No. 2B finish, a cold reduced stainless steel sheet, can be brought up to standard No. 4 polish by a few minor grinding operations that are simple tasks in the hands of experienced operators.

The next time you see new, shiny

stainless steel tableware, particularly that which has been placed on the market in the last six months, you wouldn't believe that this metal came from the steel plant without the mirror-lustre that would permit milady to powder her nose. The manufacturer buys cold rolled No. 2B finish stainless and produces the desired lustrous finish by the use of his own polishing equipment.

But don't get a distorted idea that the finishing and polishing of stainless steel with a swing grinder is a job that can be done with efficiency and precision by a novice. It's delicate work that demands the skilled hand of an artisan who knows where to start and when to stop polishing and buffing.

For years manufacturers of all kinds of products looked with longing eyes on stainless steel. Many of them saw

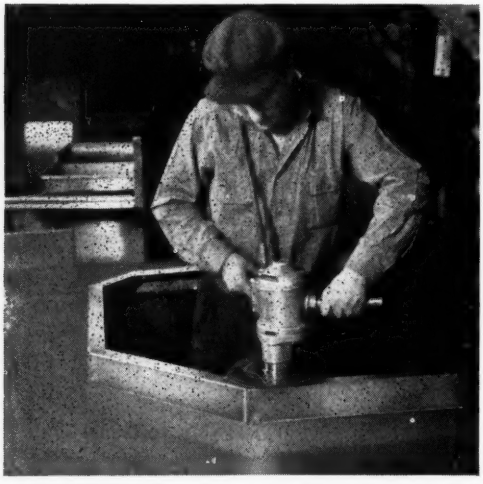

Fig. 1—The last polishing operation, for which the operator uses a fine-grained buffing wheel.

in the new royalist among metals a new and mighty sales appeal for the finished goods they placed on the market. Special cold rolling processes had not as yet been perfected, and the laborious tasks of polishing in their own factories zoomed costs to heights they considered excessive even in the face of stainless steel's superior corrosion resistance, great strength, hard surface and silvery finish. It was almost mandatory that a fabricator buy sheets that had been polished at the steel mill according to his individual specifications. In the steel mill it was a laborous hand-operation that started from hot rolled sheet bars. Operations had not been developed to the degree that characterizes today's successful continuous rolling methods.

Thus the greatest advancements in a far-flung fight to bring costs down to lower levels have been centered in the rolling and finishing processes.

Alloying materials which make stainless what it is—chromium and nickel—are expensive. Even in so largely a mechanized industry as steel, production of stainless is somewhat of a throw-back to the days when hand labor was slow and costly. It must be made with the greatest of care, and in relatively small furnaces. If there are flaws in finished ingots they must be ground out by swing grinders in the hands of brawny giants. Its toughness and hardness make rolling and shaping expensive jobs. Greater production alone can't solve the problem of costs.

The slightly milky or cloudy shade of the cold reduced No. 2B finish stainless sheet can be removed by a polishing operation with only one or two wheels, followed by a buffing operation. One manufacturer who experimented with polishing these sheets during the last six months found his

workers could polish a cold reduced sheet to the desired lustrous finish at a cost that was 50 per cent less than the original cost of a highly polished sheet.

This saving is being reflected in new markets for this metal with a permanent luster. It is making heavy inroads in the railroad field. Many automobile manufacturers are using stainless steels for trim instead of chrome plated non-ferrous materials. The baby product of the giant iron and steel industry also is being used extensively in such widely diversified products as airplanes, steamships, canning and textile mill equipment, soda fountains and lunch counters, store fronts, kitchen sinks and household refrigerators, sinks, in dairly equipment and for tableware.

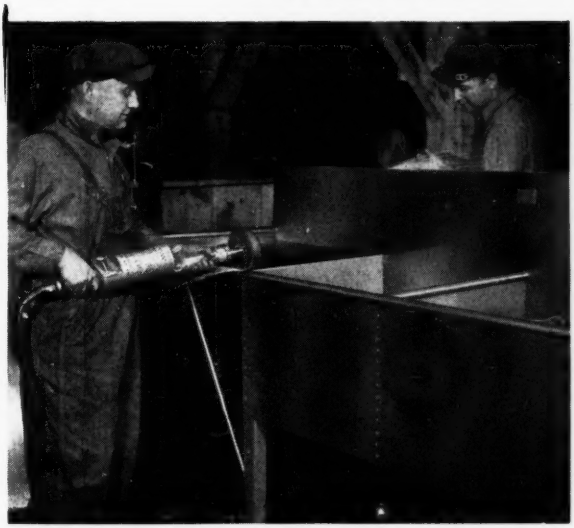

Fig. 2—After the wheel marks have been removed, expert operators swing into action with electric grinding and polishing tools to make sure that the entire surface is uniform.

Discovery and development of the "shotweld" process of welding has given impetus to the trend toward stainless steel. By this method strips can be joined for all time with a series of almost imperceptible yet practically indestructible welds. The great secret of the machine lies in its timing. The physical properties of the surrounding metal are not disturbed because the heat which makes the weld is applied for only a tiny fraction of a second.

Polishing operations are generally described as roughing, dryfining, greasing and finishing, with the degree of finish dependent on the standard set by each plant for the operation.

When the fabricator buys cold rolled stainless from the mill, he finds that one of the first considerations in polishing the metal is its low heat conductivity. This factor calls for great care to prevent overheating with subsequent warping or burning of the metal. Therefore, the speed of polishing wheels must not be too great nor should they be applied with too much pressure. It must be kept in mind that stainless steels are much harder than any other bright metals. Therefore, the removal of a lighter surface film must be expected with each passage of the grinding wheel.

It has been found that portable grinding equipment is satisfactory. A machine with handles set at right angles to each other enables the operator to watch his work more carefully without interference from grinding dust and sparks, and at the same time will prove far less tiresome for his wrists.

The first rough grinding operation requires a free-cutting wheel, made

up with the necessary grit bonded in rubber, bakelite or some other similar resinous material. A cup-shaped wheel is preferable to the plain disc type. It has been shown that these wheels, while rather soft, do not load up with metal or glaze over the surface as readily as the ordinary grinding wheel. Wheels used for polishing and buffing are of the soft cushion type built up from muslin discs pressed on a spindle with or without cardboard spacers. Some operators prefer that these discs be sewed together spirally; others depend on pressure from end plates for compactness.

The speed of wheels for rough grinding should be approximately 6,000 to 8,000 linear feet per minute and for buffing about 9,000 to 10,000 linear feet per minute.

Selection of the first abrasive material depends entirely upon the condition of the surface to be polished. Both considerable time and materal may be saved at this point if care is exercised in beginning with a grit that is coarse enough to reach the bottom of pits and scratches. Beginning with No. 1 pickled finish of Armco stainless steel, it will be generally found that a No. 80 grit is sufficient. Some operators have been successful in substituting a No. 100 grit for this operation.

The surface should be rough ground until all pits, scratches and other surface blemishes have been removed. It is suggested that the No. 100 grit be followed with a carbon oil grind using a No. 120 grit to remove No. 100 grit lines.

From this point it is a matter of skill and judgment on the part of the operator as to the selection of finer grits to produce the desired finish.

The criterion of finish becomes more important as the operation goes to finer size of abrasive grain.

Using Armco No. 2B cold reduced sheets, it is easily possible to start with No. 100 or No. 120 grit, thereby cutting polishing costs.

Regardless of the procedure, the final finish depends on the fineness of the last grit used and the skill of the operator in removing the grit lines created by the previous operation. As an aid in determining when to change to a finer grit, it is advisable to alternate the direction of grinding with each new wheel.

On welded articles, it is necessary to remove the weld scale to insure maximum resistance to corrosion. This can be accomplished simply by the use of a stiff fibre hand brush or a rotating brush or grinding wheel. It may sometimes be desirable to grind the weld bead flush with adjoining surfaces. If, because of warping, low areas occur along the weld bead, these points can be bumped with a weld hammer along the under side. This eliminates the possibility of excessive grinding with subsequent thinning of the section.

Some operators prefer a No. 30 grit for grinding welds, others choose a No. 80 grit. It must be remembered that the smoother the finish, the more resistant the surface will be to corrosive attack. When the ground area appears to widen, it is an indication that the sheet level has been reached. It is recommended that a weld length of about eight to twelve inches be completed at a time. The next step is to thoroughly wash the ground areas with a 10 to 20 per cent nitric acid solution to remove foreign material which is apt to cause corrosion, followed by a water rinse to prevent spotting by drying of the acid.

Operators are urged to always perform the final polishing operation in the same direction that sheets were originally polished.

In buffing stainless steels, it is not

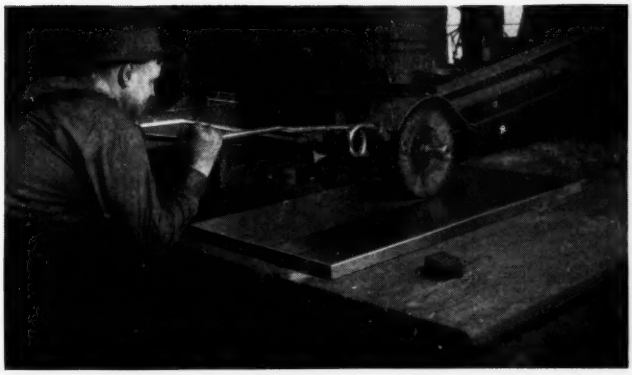

Fig. 3 — A swing grinder operating at full speed removes all traces of surface blemishes.

advisable to use grinding wheels which have previously been in contact with carbon steel grades or metals other than stainless. It is recommended that a fibre brush be used—never a wire brush. Also, grinding wheels should be made of special grits for use on stainless steel.

The most successful operators do not use buffing compounds containing iron oxide lest the surface be contaminated with particles of iron. To obtain the most satisfactory color, they use commercial compounds based on aluminum oxide and then follow with a color buff (preferably on another wheel) using green chrome oxide rouge.

Armco stainless steel cold reduced sheets may be polished to a high lustre in the fabricator's plant at a comparatively slight cost. These sheets are available in 13 to 26 gage inclusive and up to 36 inches wide. The lighter gages in this range are naturally less susceptible to tiny pits or other surface imperfections, commonly associated with a cold rolled unpolished finish. Most of the sheets can be given a bright polish in three to seven passes across a soft muslin buffing wheel. If any small imperfections remain, local treatment may be given with a No. 120 or finer grit with an oil or dry grind. In many cases a No. 240 or No. 320 grit can be used for this operation, and these fine abrasives are preferable.

Usually it will be found that very little grinding is necessary to remove imperfections in the surfaces of these cold reduced stainless steel sheets.

Porter-Cable Sander-Grinder Bulletin. A bulletin describing the Porter-Cable Take-About Sander-Grinder, as well as other sanding machines, has been issued by The Porter-Cable Machine Company, 302 Wolf Street, Syracuse, N. Y. Copy free upon request.

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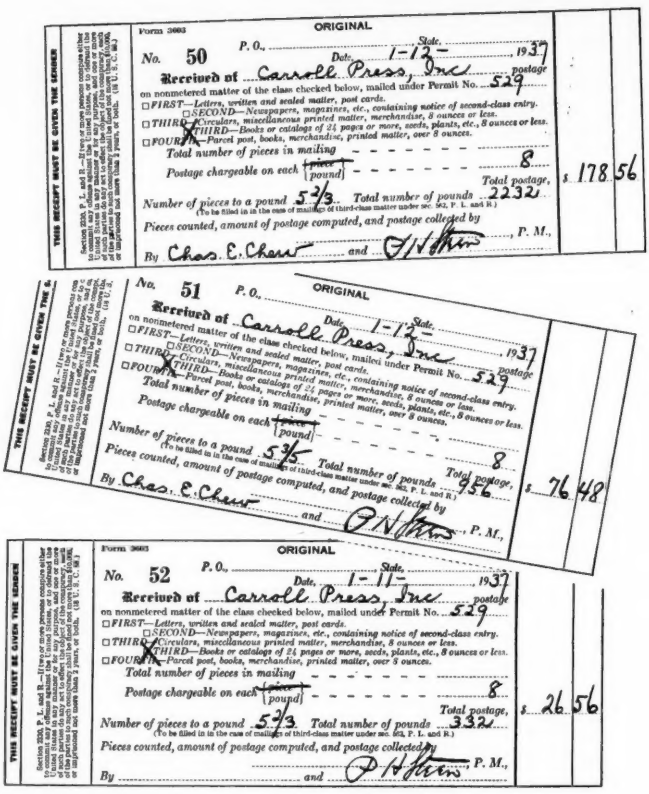

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Resinoid Wheels; Their Characteristics and Applications

By Henry R. Power

GRINDING operations today are performed more quickly and with greater ease, due primarily to a vast amount of research and the application of the knowledge acquired during the course of such research. In the laboratory under the supervision of the abrasive engineer, modern electric furnace abrasives and bonding vehicles which possess remarkable qualities have been developed. Among the electric furnace abrasives is a green grit silicon carbide with hardness comparable to the sapphire or diamond. To hold the green grit silicon carbide rigidly on a wheel during its working life, a synthetic resin bond known today as Resinoid is used.

Resinoid is really more than a synthetic resin because it can be chemically controlled to a wide range of usefulness. Sufficient evidence concerning the molecule of this compound has been gathered so that it now can be classified in at least two ways. One classification or group is a "long" molecule in which the atoms are in linear or chain formation. This chain formation is held together by cohesion, the force of which is weak laterally. Due to this formation, the long type molecule is soluble in all stages of polymerization. In the mineral world, there is the structure of mica which is built up in layers and is easily separated even though the forces in other than the lateral direction are stronger.

The other classification of the Resinoid molecule is very compact and complex. In this case, the molecular growth may occur in several directions resulting in a three dimensional polymer. The growth is known as the "A", "B", and "C" stages depending on the extent of the polymerization. In the A stage, the product is soluble and fusible and more or less readily attacked by chemical reagents. The B stage is an intermediate stage which is less soluble and fuses with difficulty. The C stage is insoluble and infusible, thus making a strong, compact molecule which is suitable as a bond for abrasives. The molecule is very large in this stage and only primary valence forces hold the atoms together. Among the minerals, the diamond forms an analogy. Here, the atoms of carbon are all equi-distant giving a structure more compact than any known substance. Among the three dimensional polymers are glycerolphthalate polyesters, phenol-aldehyde, and cresol-formaldehyde resins.

For elastic type wheels, the Resinoid bond compares favorably with shellac or rubber. The characteristics which make its use desirable are its mechanical strength, elasticity, and the fact that it is adaptable to a process of wheel manufacture that gives an open, porous structure which is essential to a free, cool-cutting wheel. The mechanical strength of abrasive wheels bonded with Resinoid permits them to be safely operated at speeds up to 9000 s.f.p.m. On one particular

type of machine used for cutting-off purposes, the wheels are being operated at speeds as high as 15,000 s.f.p.m.

It must be understood, however, that all resinoid wheels cannot be operated at 9000 s.f.p.m. since softer grades are made and these should be operated at the standard speed recommended for vitrified wheels. In many cases, it has been found that the more closely the speeds are maintained to the maximum of 9000 s.f.p.m., the greater will be the production rate and the longer will be the life of the wheel. This is particularly true in the snagging and rough grinding field where the machines can be changed to maintain the speed, thus making possible the practical and economical application of these wheels.

It should be remembered that in service the abrasive wheel is constantly diminishing in diameter and as a consequence the relation of the wheel speed to the work speed is constantly changing. The reduction in diameter of the abrasive wheel tends to decrease the arc of contact between the wheel and the work. As the abrasive wheel diminishes in diameter, the wheel will act "softer" and if the grade strength has been properly balanced against the initial wheel and work speeds, the wheel will probably show excess wear under the increased stress imposed.

In some instances, some of the hard grade wheels which can be operated at high speeds are producing economically at from 6000 to 6500 s.f.p.m. These instances represent certain roll grinding and cam finishing operations where the machines have not been converted to high speed. The advantages to be derived from the use of high speed remains to be determined on merits of the individual application. On rough grinding or snagging operations, Resinoid bonded wheels give a high rate of stock removal.

There are several factors which affect the rate of stock removal which are entirely apart from the ability of the wheel to remove metal. The metal must be presented to the wheel as rapidly as the wheel is capable of removing it, in order to obtain maximum economy. Handling time is governed largely by the shape and size of the casting and the distribution of the metal that must be removed. In view of these facts, it is very essential that careful analysis of each application should be made to ascertain all grinding problems present before definitely recommending the use of any one particular type of wheel. So-called high speed wheels are not necessarily high production wheels unless the metal can be presented to the wheel rapidly enough to permit grinding at an economical rate. The rate of metal removal must be sufficiently high to lower direct labor and overhead grinding costs.

The matter of pressure on the work is very important. In the operation of Resinoid wheels, there is a point where, with relatively light pressure, the maximum cut is obtained and when this pressure is increased, the result is a large abrasive loss with no compensating increase in stock removal. To further emphasize the sensitivity of high speed wheels to pressure, it has been found to be very helpful to mount high speed, swing frame grinders on overhead trolleys to prevent the machine from being thrown off center while in operation. In order for the grinding machine to give the best results, it should move easily and freely so that the operator in trying to overcome the inertia of the machine will not be inclined to place too much pressure on the work and thus lose the abrasive material.

The effective pressure for a Resin-

(Continued on Page 54)

The Editor's Page

Old Man River

DURING the month that has elapsed since the previous issue of this magazine went to press a considerable part of this country has experienced a major calamity — a calamity second only in importance to the World War. Whole cities have been engulfed in flood waters; whole communities have been forced to leave their homes and all but comparatively light baggage, and millions of dollars are represented in property losses and the costs of rehabilitation.

Water, like fire, is a good servant but a bad master. Large cities are located on inland waterways for definite reasons, and the suggestion that all cities should be built on high ground, away from large streams, is impractical. But the time has come when plans must be worked out and completed to restrain our large streams and prevent any possibility of a repetition of the disaster from which a number of our most important communities are now recovering. Failure to set flood control machinery in motion in the immediate future will constitute criminal negligence on the part of our government.

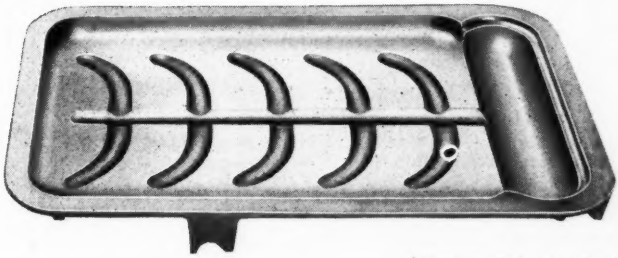
Cincinnati

Not necessarily because the city referred to is our "home town", but because it is an important machine tool center, we feel that the metal working industry in general will be interested in what we have to say regarding the flood and Cincinnati. Far be it from us to belittle the press or the radio and the magnificent work that was done by both of these agencies while the flood waters were running rampant through streets and homes. Without the radio, particularly, and the heroic work that was carried on by the announcers in the flooded areas, the loss of life due to flood from flood and disease would have been much greater. But with all the good work that was done, there was a certain amount of tendency on the part of some of the newspaper editors and radio announcers to exaggerate in an effort to capitalize on the "headline material" available.

Fortunately for Cincinnati, it is so situated that only a comparatively small area along the river bank and in one valley are low enough to be inundated, and while these districts contain hundreds of homes and stores and a number of factories, the area referred to comprises probably less than 5 per cent of the city proper. No one in Cincinnati was overcome by the flood, although one person fell into a sewer and another was drowned while doing rescue work. Yet a deliberate attempt was made by a well-known radio announcer who came to Cincinnati while the flood was at its height to create the impression that the city was a raging torrent and that most, if not all of it, was completely under water. This is a libel which has damaged the city severely.

Most of Cincinnati's factories are on high ground and out of danger from flood waters. No damage has been done to these plants. However, many of them have been compelled to close temporarily because of the shortage of water and power, due to inundation of the city's water and power plants. With the resumption of these services—which will have been accomplished before this magazine is mailed—the majority of Cincinnati's industries will be operating at normal again.

FINISHES that aid in appearance and utility



(Aluminum Industries, Inc.)

(Above)—Permite broiler plate made by the Permite Permanent Mold Process. The Permite method of casting makes it possible to give these products a high polish; thus they may present a lustrous finish. The light weight and polished finish of the broiler permits steak, fish, or other entree to be served directly from it at the table. Stove manufacturers are now equipping their ranges with broiler plates of this ware and thus gaining a strong sales advantage for their product.

(Below)—The new methods of coloring metal strips have brought this material into popularity for decorative treatment such as is shown here. The bright metal backgrounds for the display are made from chrome copper. The decorative strips on the counters are Chromaloid-over-wood.

(Chicago Metallic Sash Co.)

NEWS of the INDUSTRY

London Electrodeposition Conference

The First International Electrodeposition Conference, which has been organized by the Electrodepositors' Technical Society, will be held in London, England, on Wednesday, March 3, and on Thursday, March 4. Papers to be read at this convention have been accepted from Belgium, Czechoslovakia, France, Germany, Holland, Russia, Switzerland and the United States. All inquiries regarding the conference should be addressed to the Hon. Conference Secretary: H. Wynne-Williams, 12A, Raleigh House, Larkhall Estate, London, S. W. 8, England.

Bullard-Dunn Appoints General Manager

Mr. Thomas H. Wilber has recently been appointed General Manager of the Bullard-Dunn Process Division of The Bullard Company, Bridgeport, Conn. This division supervises and licenses the

Thomas H. Wilber

use of the Bullard-Dunn Electro-Chemical Process for the descaling of metals.

Mr. Thomas E. Dunn, Jr., has been appointed to the sales department of the Bullard-Dunn Process Division of The

Thomas E. Dunn, Jr.

Bullard Company, Bridgeport, Conn., and will have his offices at 309 Miller-Storm Bldg., 12015 Linwood Ave., Detroit, Mich.

Swartz & White Occupies New Quarters

Swartz & White Manufacturing Co., whose plant at 243 Water St., Binghampton, N. Y., was recently destroyed by fire, is now in full operation in new and larger quarters at 215 Washington St., Binghampton. There has been no delay in manufacturing and this company is in a better position than before to furnish flexible shaft equipment.

Patterson Foundry & Machine Company Appoints Sales Engineer

W. Harlan Henszey, District Manager of The Patterson Foundry & Machine Company, Widener Bldg., Philadelphia,

Pa., has announced the appointment of George L. Anderson, as sales engineer at that office.

Mr. Anderson is a chemical engineer with 20 years' experience in the design, application and sales of process equipment in chemical, food and industrial plants in the process industries.

Mixing Equipment Company Acquires New Sales Manager

E. S. Bissell, technical adviser on industrial application of the Instrument Division of the Bausch & Lomb Optical Company since 1929, has joined the Mixing Equipment Company, Rochester, N. Y., as sales manager. Mr. Bissell's duties will also include the direction of advertising and sales promotion.

Hilo Varnish Corporation Adds Consultant to Staff

In line with its policy of giving customers the best assistance through its service department and laboratories, the Hilo Varnish Corporation, 42 Stewart Ave., Brooklyn, N. Y., has added Dr. C. B. F. Young to its staff as consultant. Dr. Young is an instructor, both at Columbia and New York University and is well known as consultant in the electroplating industry. He will act as consultant on problems relating to lacquering, enameling, and japaning on metal.

Crane Packing Company Opens New Houston Warehouse

Due to an expansion program made necessary by an increased demand for "John Crane" packing and by the growing scope of the company's service facilities, the Crane Packing Company, Chicago, Ill., has moved its Houston, Texas, office from 911 Electric Building to 1303 Capitol St., where it has established a new factory branch and warehouse.

A complete stock of John Crane packing is now being carried in Houston The move to larger quarters was carried out under the direction of Mr. Roy Blackbird, Crane Packing Company manager in the southwest territory, who will be in charge of the new branch warehouse.

American Foundry Equipment Company Announces Expansion Program

The American Foundry Equipment Company, 555 S. Byrkit St., Mishawaka, Ind., announced that a contract for building additions to their plant and engineering building has been let.

This expansion, upon completion, will double the engineering and erection space now available. The addition to the manufacturing plant will be used for the assembly of specially designed Wheelabrator equipment. Both buildings are to be of modern fabricated steel construction and will be completely fireproof.

Leslie L. Andrus, assistant sales manager for the past two years, has been appointed general sales manager in charge of all sales, service and advertisings are to be of modern fabricated steel Mr. O. A. Pfaff, Vice President and General Manager.

Born in Columbus, Ohio, in 1901, Mr. Andrus received his technical training at Purdue University where he was graduated in 1924 with a bachelor of science degree in mechanical engineering.

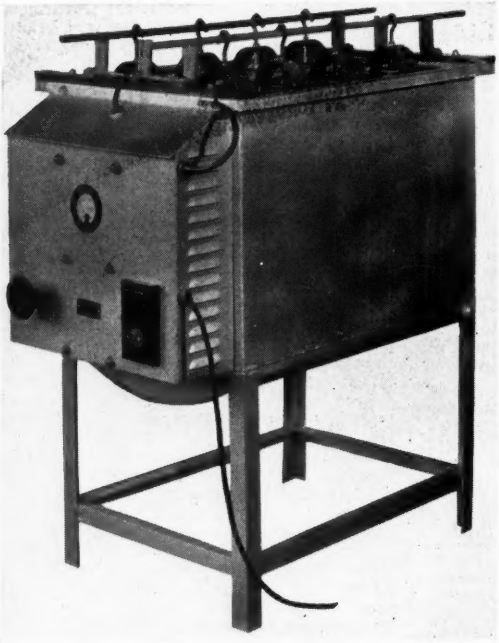
Following graduation and prior to his present connection, he was associated with the consulting engineering firm of Sargent and Lundy Company, Chicago, where his experience covered drafting, equipment purchases, and field installation and operation.

Ajax Reciprocating Drive Bulletin No. 20. The Ajax Reciprocating Drive for screens, conveyors and feeders, manufactured by Ajax Flexible Coupling Co., Westfield, N. Y., is presented in this six-page illustrated folder. The Ajax Reciprocating Drive consists basically of two offset weights, mounted on shafts and geared together so that when one shaft is rotated the other must also rotate at the same speed but in the opposite direction. When the weights are rotated, the housing in which they are mounted travels back and forth in the plane in which the weights pass each other. If the housing be securely fastened to a structure that is free to oscillate, such as a screen frame, box,, hopper, feeder or conveyor, a straight line reciprocating motion is transmitted to the carrier. The drive is adapted to the inclined mounted or suspended screens, pan feeders, hoppers, and so on. The principle of the Ajax Reciprocating Drive is explained and illustrated and a chart is included giving performance curves which indicate the length of stroke or amplitude of vibration that will be imparted to any given weight up to 800 lbs. The drive is made in six sizes to operate at maximum r.p.m. from 800 to 2000. Copy of this bulletin free upon request.

New Plant Equipment and Materials

Circo Model "B" Tin-Plating Machine

A machine for tin plating cast iron pistons and for a wide variety of small metal parts has been announced by the Circo Products Company, 3088 W. 106th St., Cleveland, Ohio. The machine is



Circo Model "B" Tin-Plating Machine

said to feature a new power unit and a new bath at lower unit cost, including first cost, operating current and labor cost.

The unit dispenses with the usual motor and generator. It is connected to the regular 110 volt, 50 or 60 cycle, A.C. line. The current is changed to the current necessary for the tin-plating bath as it passes through the Powr-Pak.

Laboratory analyses are rarely required. The unit operates without the usual tin anodes. Among other advantages, the deposits give good protection, being uniform over the entire surface and are firmly adherent, thus eliminating the disadvantages of spots. The bath, being only mildly alkaline, does not cause rapid deterioration of equipment. The machine can be operated continuously with the solution being heated to 150 deg. F. by gas or any other heating medium.

The electrotinning process, carried out by means of the Model "B", combines all the elements which go to make up profitable operation, economy, simplicity, adaptability, and good deposits. The bath can be used to tin plate almost all ferrous and non-ferrous metals. It is applicable to pieces of any shape and size within the limit of the unit. The general rate of deposit is said to be 0.001 in. per hour.

The Circo Model "B" has an approximate capacity of 40 gal. It is 32 in. long, 22 in wide, and 38 in. high.

Roxalin Ground Coat Material for Wood Grain

A base coat or ground coat material has been developed for use under wood grain reproductions by the Roxaline Flexible Lacquer Company, Box 772, Elizabeth, N. J. This product is especially suitable where the wood grain effect is to be used on metal parts that are to be fabricated from flat sheets.

The ground coat material may be roller coated without silking, and without the use of size on sheets of different base metals. It is said to require

only a short force-dry or a low temperature bake after which the wood graining can be applied.

There is also a clear top coat or protecting coat which may be applied in a roller coating machine or for small parts by dipping or spraying. After baking, the system can be buffed in the sheet to a high lustrous wood-effect finish with excellent depth, and then blanked and formed into the necessary shapes. Even where the metal has been considerably formed, the degree of adhesion and toughness is so great that the surface cannot be marred.

Metso 66

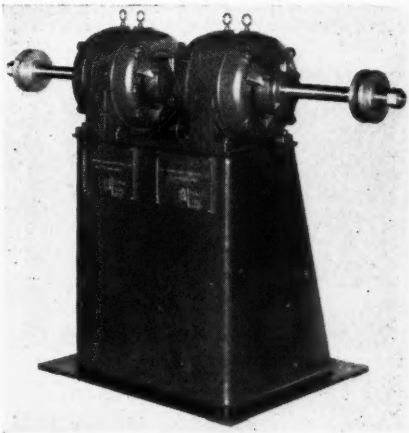
A metasilicate cleaner for metals of all kinds, to be known as "Metso 66," has been brought out by the Philadelphia Quartz Company, 121 S. Third St., Philadelphia, Pa. This cleaner is rapidly soluble and has a special emulsifying ingredient which gives it increased efficiency.

Metso 66 is said to eliminate additions of soap or rosin which are often necessary where basic alkalies are used. It is particularly adapted for electro-cleaning prior to plating, soaker type cleaning, and cleaning steel prior to enameling.

Production Type 301H Double Spindle Buffer

The illustration shows the Type 301H Double Spindle Buffer which has been brought out by The Production Equipment Co., 5219 Chester Ave., Cleveland, Ohio. The buffer is designed to include two independent "motor-in-head" single extension buffers mounted on one base. Each motor is controlled by a separate magnetic starter, allowing each spindle to be run to suit the convenience of the operator.

The motor bearings are of unusually large design, giving a spindle extension diameter of 1-13/16 in. The spindles are made standard to allow a clearance of 13 in. between the side of the base and the inside of the wheel. The motors supplied on Type 301H are of semi-enclosed construction, allowing the use of smaller frames, and similar designs using totally enclosed motors are also available. The rating of each motor ranges from 4 to 10 h.p. Spindles speeds for 60 cycle service are either 1800 or 3600, and when such speeds meet operating requirements, this double spindle motor-in-head construction is definitely economical.



Production Type 301H Double Spindle Buffer

Wheelabrator for Cleaning Minute Metal Parts

Small metal stampings weighing as little as 1/283 of an ounce can be suc-

Polish and Buff *Automatically*

You increase hourly production and cut hourly costs. Large production on shapes, sizes, metals and finishes done at a profit.

Act today—write the pioneer builder of Automatic Polishing and Buffing Machines for a production proposal on that "hard to finish" part.

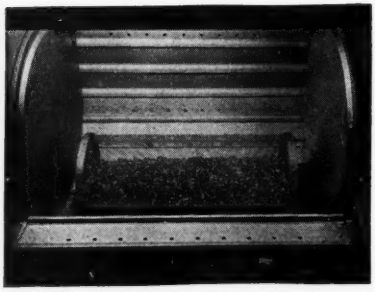
THE PACKER MACHINE CO., MERIDEN, CONN.

PACKER

POLISHING AND BUFFING MACHINES

cessfully cleaned, preparatory to nickel plating, in the "American Wheelabrator Tum-Blast" now being marketed by The American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Indiana.

The stampings are cleaned in cylindrical wire mesh baskets which roll over



American Wheelabrator Tum-Blast

and over in the abrasive blasting zone, causing a constant turning and cascading of the tiny stampings and exposing them to the scrubbing action of the blast. The wire baskets are constructed of No. 6 wire mesh with solid ends made of 14 gauge steel. A gate for filling or emptying the baskets is firmly built to one end. The wire mesh used in the design of the basket is large enough so that it will not retard the efficiency of the blast and is small enough to prevent the escape of the small metal parts. No. 90 steel grit is the abrasive used for the cleaning of these small parts. A surface suitable for nickel plating is obtained after only 30 minutes of Wheelabrating.

Centrifugal force replaces compressed air as the driving agent in whipping abrasive onto the material to be cleaned. Abrasive is gravity fed into the center of the Wheelabrator from an overhead storage bin. After blasting, the abrasive drops through holes in a conveyor plate into a hopper below where refuse is automatically screened out. The cleaned abrasive drops into the boot of a bucket elevator and is lifted back to the storage hopper for reuse.

The steel grit may be used over and over until it is reduced to a dust which is carried out of the Wheelabrator Tum-Blast housing by an American Dustube dust collector which is operated in conjunction with the machine. Abrasive cycle used in Wheelabrating is constant until the machine is shut off for loading or unloading.

Bond-Rite Cement and Thinner

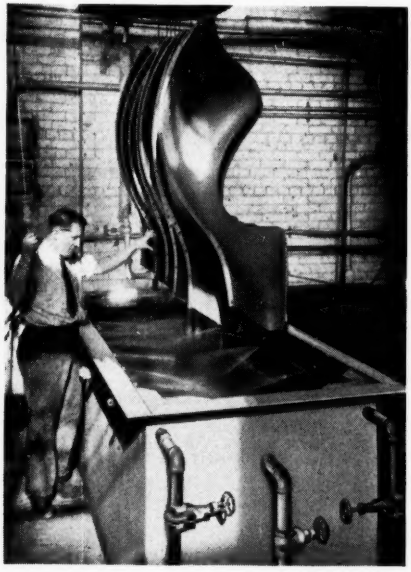
An inorganic, water soluble cement for leather, felt, cotton, canvas, paste, and leather covered wheels, and belts, to be known as "Bond-Rite", has been placed on the market by Adhesives, Inc., 525 Lafayette Ave., East, Detroit, Michigan.

Bond-Rite cement is obtainable in five grades. Each grade is said to withstand extreme frictional heat while in use, neither glazing, losing any of its tenacity, nor softening. A polishing wheel set up with Bond-Rite is said to polish a maximum of work with a maximum of speed. The cement can be applied cold to cold wheels or belts to set cold grain. The five grades of Bond-Rite cement now on the market are the 110, 120, 130, 140 and 150, in addition to the 600 thinner and 700 sizer.

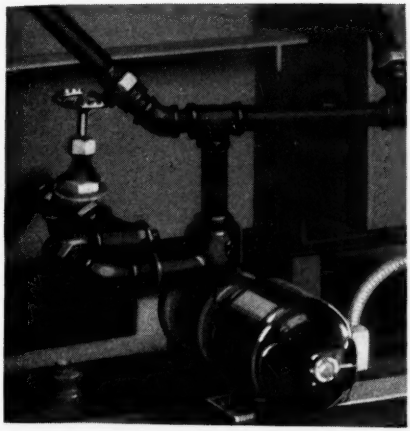
Dip-Spray Bonderizing Process

A process that produces a corrosion inhibiting coating on galvanized, zinc alloy and cadmium surfaces, as well as on iron and steel,, to be known as the Dip-Spra Process has been announced by the Parker Rust-Proof Company, 2193 Milwaukee Ave., Detroit, Michigan.

In addition to being corrosion resist-



Dip-Spra Bonderite Tank Showing Spray Pipe Installation



Circulation Pump Attached at One End of Dip-Spra Bonderite Tank

ant, the coating is highly adherent, being integral with the metal itself and since it is slightly porous, it is said to form an ideal base for any paint finish

The Dip-Spra Process combines the coating efficiency of Spra-Bonderizing with the low equipment costs and convenience of an immersion process, as well as widening the utility of Bonderizing to include certain non-ferrous metals. The process is said to be of great interest to manufacturers whose products must be painted, especially those who have had difficulty in securing effective adherence of paint to galvanized or other zinc coated surfaces. It is claimed that the coating produced by this process will increase the paint-holding efficiency five to seven times.

The equipment requirements are comparatively simple and easy to install, consisting essentially of a steam heated processing tank of suitable size in which a spray pipe is placed above the solution level. The spray pipe is of plain stainless steel, drilled with a series of ⅛-in. holes from 2 to 4 in. apart through which the solution is circulated by a small pump, placed at one end of the tank. Large or deep tanks can be fitted with a spray pipe on each side.

Mall Tri-Position Mounted Grinder

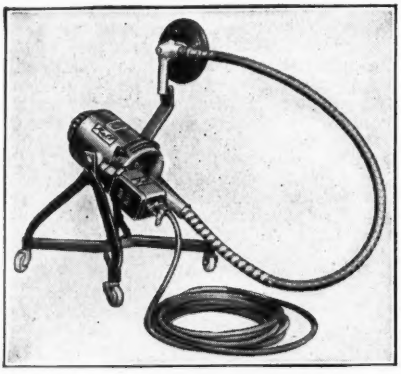
The Mall Tool Company, 7740 S. Chicago Ave., Chicago, Ill., has recently added a heavy duty, tri-position mounted

Make YOUR Polishing Wheels SAFE *with* "Buffalo" EXHAUSTERS

● Equip your emery and polishing wheels with these powerful, dependable Buffalo Fans to make the shop cleaner, the work finer, and the health of your employees better. Proper dust control reduces the possibility of silicosis among your employees. That means lower operating costs. There is a Buffalo Fan for every blowing or exhausting job. Write for Bulletin 410-3.

Buffalo Forge Company
190 Mortimer St., Buffalo, N. Y.
Branch Engineering Offices in Principal Cities
In Canada:
Canadian Blower & Forge Co. Ltd., Kitchener, Ont.

grinder to the Mall Tool line of portable grinders. The tri-position mounting permits the grinder to be used in three



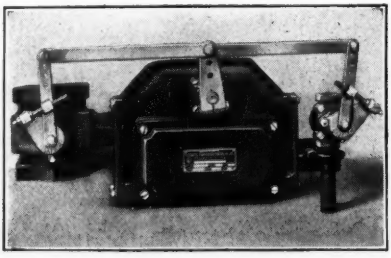
Mall Tri-Position Mounted Grinder

positions; as a bench grinder, suspended from overhead, or as a regular floor machine.

This type of mounting affords unusual portability, and is especially adapted for use in confined places. The grinder, which is recommended for heavy duty casting, snagging, removing excess metal after welding, polishing stainless steel, and numerous other metal working jobs, can be had with either 1½ h.p. or 3 h.p. dustproof motors.

ATC Balancer

The Automatic Temperature Control Co., 34 E. Logan St., Philadelphia, Pa.,



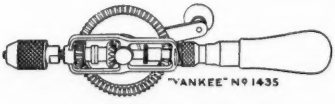
ATC Balancer

has brought out an electrically operated control mechanism, to be known as the "ATC Balancer," which regulates the fluctuations of such variables as temperature and pressure by the movement of valves or other correcting devices in amounts exactly proportional to the deviation of the variable from the desired normal.

Where that desired normal may be maintained by a definite valve position, except for the small changes necessary to check occasional deviations, the ATC Relatrol provides adequate control. Where load changes are of such a nature that a prolonged change in valve position is required to maintain the desired temperature and pressure, the ATC Balancer automatically and promptly compensates for the requirements of the new loading.

"Yankee" 2-Speed Hand Drill

The illustration shows the No. 1435 "Yankee" 2-Speed Hand Drill which has been placed on the market by North Bros. Mfg. Co., Dept. MS, Philadelphia, Pa. The drill was designed to handle either delicate jobs with small drills in thin metal or projection jobs on average work. The drill is 11 in. long, and provides the advantages of a high speed



"Yankee" 2-Speed Hand Drill

for fast work and slow speed for easy drilling through at the end of the hole. The shift from one speed to the other can be made with a light touch of the finger.

Hartford Triple-Action Cutting Barrel

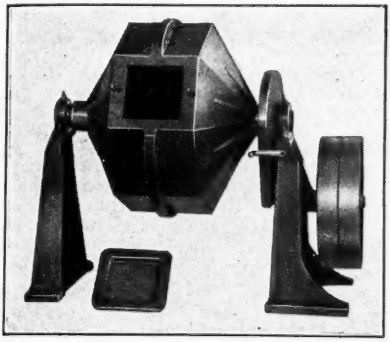
A cutting barrel designed to develop a triple-action in tumbling the material within it, to be known as the "Hartford", has been brought out by The Hartford Steel Ball Co., Hartford, Conn.

The inside of the barrel is so constructed as to produce a very rapid, flowing motion. The effect of this movement on the contents of a properly loaded barrel is to rapidly grind off burrs, fins, and smooth the general surface of any article which comprises the load. According to the manufacturer, finishing costs are reduced to a minimum because the required work is done in the least time possible.

The barrel shown in the illustration

has a capacity of 10 cu. ft. and occupies a space 36 in. by 68 in. by 48 in. high. The clearance under the barrel is 16 in. The barrel is fitted with a solid hand-hole cover. The shipping weight of the unit is approximately 1450 pounds.

The Hartford Barrel is equipped with self-aligning Fafnir ball bearings, roller chain drive, running in an oil bath. A special belt shifter locks in the "on" and "off" positions. The barrel castings are made of a special alloy, insuring long life and rapid cutting actions. Besides being used for wet grinding, the barrel



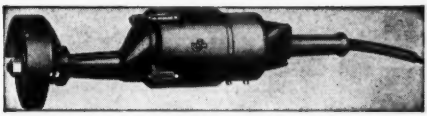
Hartford Triple-Action Cutting Barrel

can be used for dry grinding, cutting down, tumbling, pulverizing, and mixing. Whatever use to which the barrel is put, the speed and direction of the action is said to insure a quick and thorough job.

"CP" No. 970G Portable Electric Grinder

The No. 970G Portable Electric Grinder shown in the illustration has been designed by the Chicago Pneumatic Tool Company, 6 E. 44th St., New York, N. Y., to serve the purpose of general purpose grinding and, with the proper wheel equipment, for wire brushing, buffing and polishing all types of metal surfaces in all types of plants.

An outstanding feature of the grinder is the wheel economy which has been made possible because of the unusual power which is sufficient to maintain high speed under load. The motor is fan cooled and totally enclosed, providing freedom from dust troubles and overheating. It is completely encased in a copper shield which excludes dust and



"CP" No. 970G Electric Grinder

conducts motor heat to cooling air. The fan forces a strong current of air over this shield and out over the gear case onto the work.

The switch is separately and totally enclosed. Two-row ball bearings at the work end of the spindle have ample capacity for all radial and thrust loads. Every bearing is a ball bearing, mounted in steel inserts which are cast integral.

The grinder is made in two sizes: No. 950G and 970G. The No. 950G grinder has a wheel capacity of 5x¾ in., a speed of 4500 r.p.m. free and 2700 r.p.m loaded. Length overall is 23¾ in. and net weight is 13¾ lbs. The No. 970G has a wheel capacity of 6x1 in., speed of 3900 r.p.m. free and 2600 r.p.m. loaded. Length overall is 24½ in. and the net weight is 22 lbs. Standard equipment includes an adjustable pressed steel wheel guard, one grinding wheel (med. 36G), three-conductor cable and

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Model BURF Paasche High Production Airbrush. Ask for descriptive literature or a demonstration TODAY.
NEW FEATURES — Positive indexed control of pattern—multiple fan ports, balanced grip—damage proof construction — convertibility for many purposes and materials.
Paasche Air Brush Co.
1910 Diversey Parkway, Chicago, Ill.

plug. A horizontal suspension bail is provided on the No. 970G grinder only. These tools can be furnished for 32 volts and 250 volts on special order.

Binks Asphalt Spray Gun

A spray gun for heavy materials to be known as the "Thor Model 7 E" has been placed on the market by the Binks

Binks Asphalt Spray Gun

Mfg. Co., 3114 Carroll Ave., Chicago, Ill. The Binks Thor Model 7 E spray gun is designed for the most efficient application of cut back and emulsified asphalts, sound deadener, installation compounds, and other heavy materials. It can be furnished with round or flat nozzle in four different sizes. These sizes are recommended respectively for light, medium or heavy materials. The standard material inlet is ¾-in. standard pipe thread and is supplied with adapter suitable to the nozzle size ordered.

End-Shak Testing Sieve Shaker

The Newark Wire Cloth Company, Newark, N. J., manufacturers of wire cloth and wire cloth products, has announced a shaker for testing fine materials to be known as the "End-Shak".

The shaker is provided with a simplified hold-down device which permits the sieves to be easily and quickly put in place and removed, regardless of the number of sieves used. The combined reciprocating and turning motion is an outstanding feature.

Sudden jarring motions are said to be eliminated in the End-Shak. With the constant turning of the sieve, one complete revolution each minute, the particles approach, pass through, or roll over the sieve openings from every possible angle during each revolution. This causes the greatest possible amount of material to pass through the sieve in the shortest possible time, decreasing the necessity of making numerous hand tests for the end point results.

Operation of the End-Shak machine is exceptionally smooth, easy, and quiet. The nest of sieves reciprocates in a direction lengthwise of the gear box. The mechanism is entirely enclosed and operates while submerged in oil, thereby eliminating the possibility of wear and tear in the vital parts and effectively muffling any noises that might otherwise be developed.

The entire machine weighs 145 lbs., including the motor and auto time switch. The shipping weight is 175 lbs. It is 32 in. high, 18 in. wide and 22 in. long. A standard ¼ h.p., 1750 r.p.m. motor is used on 110 or 220 volt, 60 cycle alternating current. The standard auto time switch which is standard equip-

End-Shak Testing Sieve Shaker

ment with each machine automatically controls the period of the test. The machine is designed for 8-in. diameter testing sieves, and is adjustable to hold any number of sieves from 1 to 13 inclusive.

Cesco No. 686 Mask

To meet the demands for a mask in paint spraying departments, the Chicago Eye Shield Company, 2300 Warren Blvd., Chicago, Ill., has brought out a mask, to be known as the Cesco No. 686. This mask is said to be extremely light, with the weight no more than that of a cap. A specially treated hood is attached to the cap and fits snugly around the shoulders.

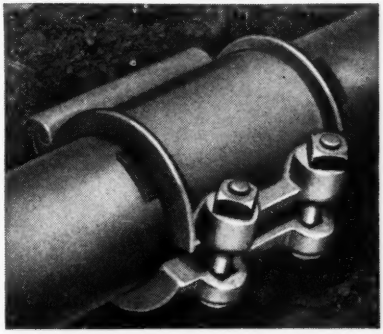
Filtered air is drawn through a rubber tube, which may be used with compressed air if desired. The window of the mask is of pyralin and is extra large, thus assuring unrestricted vision. Air is automatically circulated to prevent fogging. Re-inhalation is eliminated in this type of mask.

It is said that this mask while providing adequate protection from paint fumes and preventing eye strain offers no resistance whatever to complete freedom of motion. It is said to contribute to the wearer's efficiency and at the same time conserves his health.

Cesco No. 686 Mask

Skinner Clamp for Stopping Pipe Leaks

Leaks in pipe, regardless of size or pressure carried, can easily and permanently be stopped by the use of a special clamp that is made for this purpose by the M. B. Skinner Co., 3679 W. Sample St., South Bend, Ind. The clamp is made from a metal of high tensile strength, uniform density and hardness. Every clamp is tested under a pressure of 3000 lbs. before it leaves the factory. To use, a gasket is placed over the leak and the clamp is placed in position around the pipe and over the gasket, where it is clamped as shown. The gasket, sealed under tremendous pressure, makes a permanent repair. The clamp will seal the leak under any temperature or any pressure, for steam, water, oil, gas, air, or chemicals.



Skinner Clamp for Stopping Pipe Leaks

SAVE YOUR OLD BUFFS

Have six of them cut into sectors and mounted on a steel hub. The result is a large size buff which cuts faster, lasts longer and costs less. Write for information or better still send your old 8" or 9" buffs and we will send the complete units back for your own trial.

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Everything for Polishing and Plating
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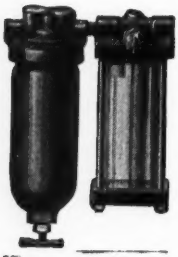
DETROIT • MICHIGAN

M-B Automatic Air Line Lubricator and Filter

The combined advantages of the M-B Lubricator and the M-B filter are offered in the M-B Automatic Air Line Lubricator and Filter illustrated herewith. Assembled in one unit, this device, product of M-B Products, 126 E. Larned St., Detroit, Mich., is effective in removing all foreign matter, dust, pipe scale, moisture, and so on, from the air line after which it saturates the air with any desired volume of oil.



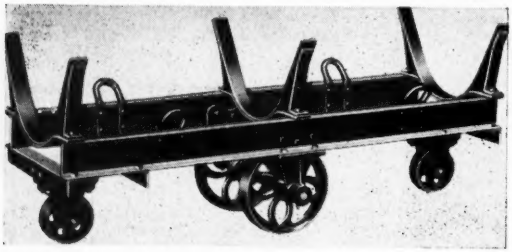
M-B Automatic Air Line Lubricator and Filter

The unit has been tested and approved for lubricating air valves, cylinders, controls, pneumatic tools, and so on, and is invaluable in any place where clean, lubricated air is desired. The use of this lubricator will eliminate costly shut-downs caused by dust in the air lines and lack of lubrication at working points. The M-B Automatic Air Line Lubricator and Filter is available in capacities of ¼-in., ⅜-in., ½-in., ¾-in., and 1-in. with standard pipe tap inlet and outlet connections.

Lansing Bar Iron Truck

A truck especially designed for the transportation of bar iron, pipes, angles and similar long unwieldly material has been placed on the market by the Lansing Company, Lansing, Mich. The truck frame is built of 4-in. channel iron. As shown in the illustration, the truck rides on two sturdy 14-in. wheels at the center and 8-in. casters at each end. It is equipped with three heavy, well-built cradles which are strongly reinforced to the frame to hold the load.

Inasmuch as the wheels are equipped with Hyatt roller bearings, the truck is easy to handle even with a full load. The truck is made in capacities up to five tons.



Lansing Bar Iron Truck

Hellige pH-Meter

Hellige, Inc., 3702 Northern Blvd., Long Island City, N. Y., has developed a pH-Meter which is said to be a unit comprising a rugged glass electrode system, a vacuum-tube galvanometer as the null-indicator, and a potentiometer that gives the reading of the test solution directly in pH units.

Hellige pH-Meter

One of the features of the unit is the sliding pH scale which can be easily lined up with the potentiometer shaft so that direct readings can be obtained regardless of the electrode system used. Compensation for room or bath temperature is made by adjusting the working current of the potentiometer to a temperature scale on the indicating meter that reads from 10 to 40 deg. C. Complete flexibility is the keynote in the design of the instrument. It is extremely simple to use. The instrument can be used as a vacuum-tube galvanometer if desired. Sensitivity is said to be 0.02 pH, with an accuracy of 0.05 pH.

Fostoria U-58 Unifocal Lighting Unit

The Fostoria Pressed Steel Corp., Fostoria, Ohio, has brought out a lighting unit designed especially for localizing illumination on benches and tables

Fostoria U-58 Unifocal Lighting Unit

which are subject to excessive vibration. Equipped with a ball and socket joint at the reflector and a spring friction joint at the top of the base, the unit is completely flexible horizontally and vertically without the use of tools, yet is rigid in any position.

The overall length of the unit is 33 in. The horizontal arm is 15 in. overall with position adjustable in a swivel clamp equipped with wing nut. The base is 14 in. high and is drilled for attachment to the bench or table.

The reflector assembly consists of the Unifocal Reflector, the supporting rim equipped with porcelain socket, and clear glass lens. Although designed for a 60 watt bulb, a 50 watt mill type or regular 40 or 25 watt bulb may be used with the proper extension socket. The Unifocal Reflector is made of spun Alzak aluminum from which the light rays are reflected onto a converging beam, bringing the light to focus about 18 in. ahead of the reflector.

The wiring includes an approved toggle switch in the lamp base and a 6-ft. extension rubber cord with plug. The finish is natural aluminum for the Unifocal Reflector and machine grey for the arm and base.

"Stop-Pit"

A solution which is used in connection with nickel plating solutions to prevent pitting, to be known as "Stop-Pit", has been placed on the market by The Plating Products Company, 352 Mulberry St., Newark, N. J. This material is made up in a semi-liquid form and is packed in one-quart glass jars, one quart being sufficient for treating 100 gal. of nickel solution.

The active ingredient in "Stop-Pit" is a wetting agent which is said to be very efficient for the purpose for which it is used. It eliminates the use of hydrogen peroxide which is generally used in large quantities to correct the pitting of nickel. "Stop-Pit" does not decompose in the solution and is usually replaced in proportion to the drag-out. It reduces the surface tension of the solution and causes hydrogen bubbles to break away from the metal surface and allow the solution to wet the metal surface, and thus permitting nickel to be deposited.

The same setting action has a favorable effect in the production of smoother deposits due to the fact that dirt particles in a solution will not ahere to the work.

Roxalin Synthetic with Perpiration Resistance

A type of synthetic with perspiration resistance which sets-up in the air almost as fast as lacquer has been developed by the Roxalin Flexible Lacquer Company, Inc., Elizabeth, N. J.

It is said to produce a beautiful, high luster, flexible finish with excellent adhesion to practically all metals, including zinc dies castings. For manufacturers operating automatic spray equipment, this new synthetic is said to be admirably suited to speed production requiring only a force-dry of from three to five minutes.

NEW SPRAY GUN

In the time it takes to adjust old fashioned paint spray equipment, you can write us for specifications and prices of the new Type MM Paint and Lacquer Spray Gun, which cuts both time and operating costs on every job and builds your profits. Bring your shop up-to-date with the new Type MM Spray Gun.

THE ALEXANDER MILBURN CO.
1436 W. Baltimore St., Baltimore, Md.

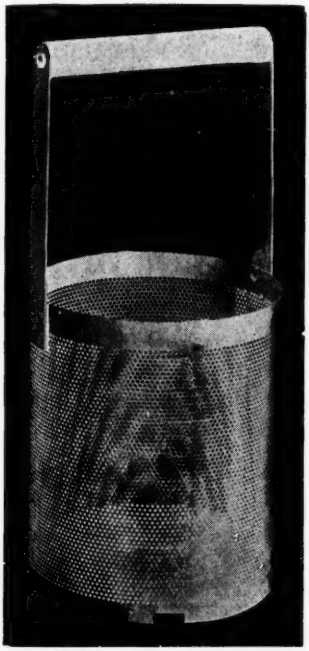
Seal-Tite Polishing Wheel Cement

Adhesive Products, Inc., 10841 E. Jefferson Ave., Detroit, Mich., has placed on the market a liquid cement which is said to be odorless, non-inflammable, and non-poisonous, to be known as "Seal-Tite." The adhesive strength of the cement is said to firmly grip the abrasive grain without surrounding or submerging it, thus more of the abrasive surface is exposed. A sharper, faster cutting surface is obtainable, in addition to a greater total area of effective cutting surface, and a longer life per set-up. Wheels coated with this cement are said to dry and season in a minimum of time, thus reducing the number of wheels in process of being recoated and reducing the needed wheel inventory. Seal-Tite is said to withstand the frictional heat of long continuous grinding, therefore multiple grain heads can be used effectively.

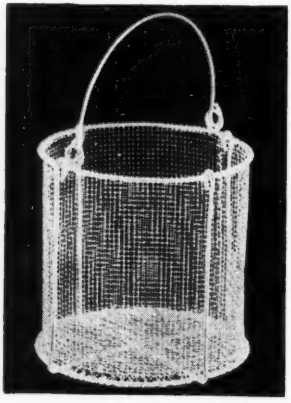
Jelliff Dipping Baskets

Dipping baskets made of a metal suited to your requirements are manufactured by The C. O. Jelliff Mfg. Corp., Southport, Conn. Baskets will be built to specifications if none of the 14 standard designs can be used.

Each basket is well made and strongly braced. In every case, the bracing is adequate to the load which the basket is to handle and in proportion to the size of the wire. The metal to be used in a particular Jelliff basket is determined by the cleaning and pickling cycle. It is obviously impossible to lay down any hard and fast rules, due to the wide variance in such influencing factors as construction of parts to be treated, character and strength of solution, method of handling, temperature, and possible galvanic action. If the Jelliff Company is supplied with these essential facts they will be enabled to recommend the basket best suited for the particular need.



Jelliff No. 00 Wire Dipping Basket



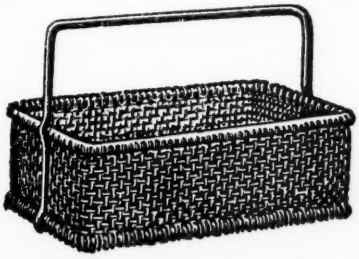
Jelliff Mesh of No. 15 Wire Dipping Basket

Aluminum baskets which are excellent for bright dipping are light in weight and of great strength in special alloys. Under ordinary temperatures they will withstand the action of nitric or sulphuric acids, but are attacked by all alkalis and by hydrochloric and hydrofluoric acids in any concentration.

Stainless steel baskets resist corrosion from practically all solutions excepting hydrochloric and hydrofluoric or pure suphurous acids, bromine, iodine and aqueous solutions of a few compounds of the halogen acids or pure sulphurous acid. It should also be remembered

that corrosion influence is largely influenced by galvanic action when in contact with other metals.

Iron and galvanized iron baskets are most commonly used in alkaline solu-

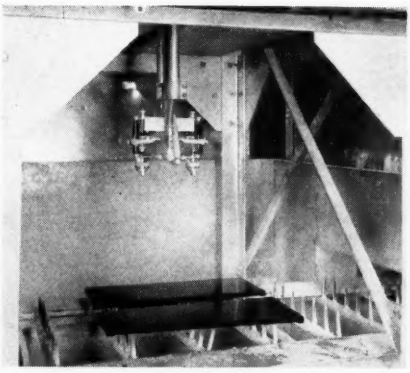


Jelliff No. 00 Wire Dipping Basket

tions. Iron resists these solutions. Jelliff baskets eliminate breakage and also effect a big saving in the acid. They carry over only a small percentage of acid. Over 1000 grades of standard wire mesh and filter cloth in various metals and popular weaves are carried in finished stock.

Binks Automatic Reciprocating Spray Machine

An automatic reciprocating spray machine which carries two Thor Model 7

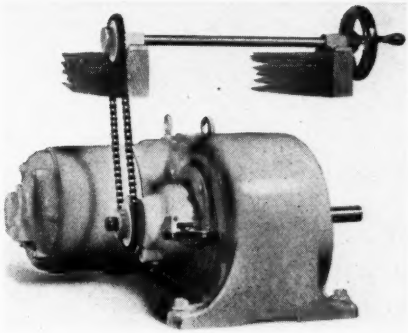


Binks Automatic Reciprocating Spray Machine

Spray Guns back and forth across flat objects moving along a conveyor has been brought out by the Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill. The guns shut on and off automatically, spraying only when they are directly over the ware. The machine as shown in the illustration can be seen spraying flat objects. It has an application over a wide range of articles including refrigerator parts, stoves, and wall boards.

Remote Mechanical Control for U. S. Varidrive Motor

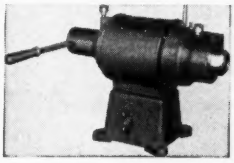
A remote mechanical control of variable speed has been developed by U. S. Electrical Motors, Inc., 202 E. Slauson Ave., Los Angeles, Calif., for use with



U. S. Varidrive Motor with Remote Mechanical Control

the U. S. Varidrive Motor also made by this firm. The bearing supports, shafts, sprockets and chains have been standardized so that the user can obtain variation of speed on the driven machine conveniently and economically. There is no slippage in the control mechanism; thus the speed control is positive. An infinite variety of speeds within the speed range of the Varidrive may be obtained.

IDEAL SPEED LATHES



FOR LAPPING FINISHING POLISHING SMALL PARTS

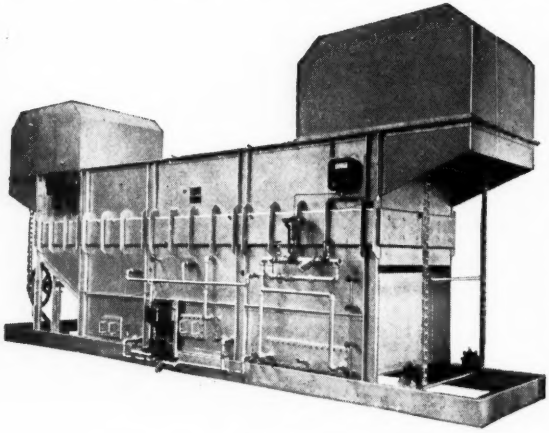
2 Speed Motor. Automatic Brake. Collet or 3 Jaw Chucks, Hand operated or automatic. Write for Cir. 351.

SCHAUER MACHINE CO.

903 Broadway Cincinnati, Ohio

Conveyorized Three-Dip Detrex Degreaser

The large three-dip degreaser illustrated herewith has recently been added to the complete line of standard and special machines manufactured by Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich. Designated as Model 3DC-650, the machine consists of three chambers which are separated by two wide overflow dams. It is equipped with a two-strand, cross-rod type conveyor, and a variable speed drive.



Conveyorized Three-Dip Detrex Degreaser

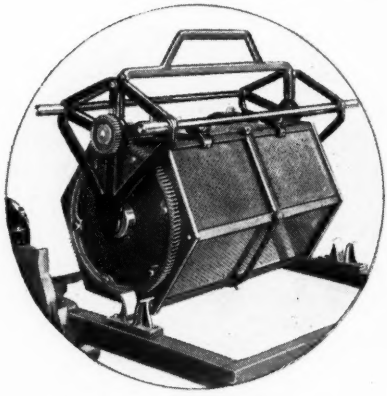
The cycle of cleaning operations in this automatic degreasing machine is: first, immersion in boiling solvent; second, immersion in solvent distillate rinse; and third, immersion in pure solvent vapors. The work is placed in baskets which are hung from the conveyor cross rods, and thus conveyed through the machine. The work is said to come out perfectly dry and clean and ready for subsequent finishing operations.

The steam coils for heating the solvent are located in the first chamber. An air-operated, steam-actuated thermostatic control is used for automatic temperature regulation. The machine is completely hooded and designed so that the natural solvent loss is less than ½ gallon per hour. A water jacket condenser completely encircles the machine and there is a solvent distillate collecting trough inside, directly beneath the condenser zone. A motor driven pump transfers the solvent between any chambers desired.

Belke Small-Lot Plating Barrel

The development of a handy plating barrel by the Belke Manufacturing Company, 947 N. Cicero Ave., Chicago, Ill., to be known as the "Small-Lot" plating barrel, enables plating plants to do small lot work at a profit. The Small-Lot plating barrel can be used in connection with still tanks, thus utilizing present solutions and anodes, eliminating the expense of making new solutions for each batch of work, and buying new anodes. It is said to do away with the bother of handling and watching baskets. It has all the high efficiency of large mechanical plating barrels and does better work than can be accomplished by still plating.

The Small-Lot plating barrel is made of a new caustic resisting bakelite developed by Belke engineers and will stand up under any kind of plating, even in high temperature solutions. By placing one on a small plating tank you have a complete mechanical plating unit.



Belke Small-Lot Plating Barrell

One of the important features of the

Small-Lot plating barrel is that the barrel is very light. The motor is mounted on a specially designed frame instead of to the barrel. This method of mounting the motor eliminates the necessity of lifting the motor with the barrel.

Like the larger Belke units the Small-Lot plating barrel has one continuous cathode conductor that is heavily insulated with layer upon layer of rubber from the bus bar to the contract knob. The cathode contact cables, which are on each end of the barrel, are constructed of heavy, flexible copper wire, the bodies of which are thickly insulated and have heavy chromium plated steel knobs on the ends. These steel knobs press down on the work to provide good contact and uniform current distribution. This is an exclusive Belke feature which eliminates and prevents treeing around open contacts and absorption of metal in the solution; thereby speeding up plating.

For further precaution against shortage, the motor take off gear in this unit is made of laminated bakelite and prevents current from passing from motor to the large driving gear on the barrel.

The hangers, like those on larger Belke units, are bolted securely to the supporting bar and eliminate any possibility of weaving. The barrel, therefore, always remains in perfect alignment.

A rubber insulated steel band encircles the center of the barrel to prevent the ribs from warping under the most severe conditions. This insures long life and maximum service.

A new and important development in barrel construction are the easily replacable bushings in the hanger where the small driving gears rotate. This enables a speedy and economical replacement of only bushings instead of the entire hanger construction, as is ordinarily necessary. Bushings are also used in the barrel flanges where the barrel rotates on the hanger axle. When the bushing wears out, it can be replaced instead of the entire flange.

The barrel walls are fitted into the barrel ribs on an angle for greater strength and support. The cylinder is made of Belke non-warping, impregnated bakelite. The cover panel is designed with Belke rubber covered spring clamps which make loading and unloading a matter of only a few seconds. Belke Small-Lot plating barrels are made in two sizes and are easy to handle.

Tanner Anti-Freeze for Air Lines

The freezing of moisture in shop air lines and air tools can be absolutely eliminated by the use of the Tanner Tank air line anti-freeze system, according to the manufacturer—Sullivan Machinery Company, Michigan City, Ind. The system is said to be harmless, odor-

Tanner Tank Anti-Freeze System

less and non-explosive. It will not injure metal, hose, or lubricants. Tanner Tanks are built of welded construction to A.S.M.E. specifications for 200 lbs. working pressure, and are easily installed. This system is guaranteed to protect air lines and air tools against freezing to a temperature of 70 deg. below zero.

THE M-B SUPER SPEED AIR GRINDER

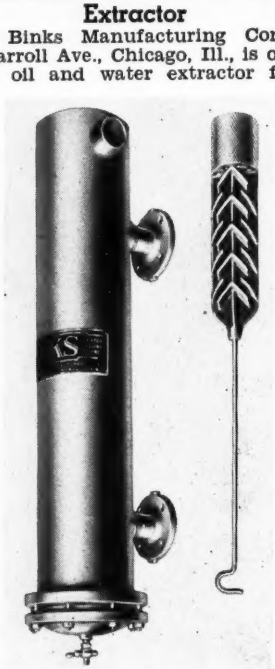
Has an amazing speed of 100,000 R.P.M. Small-Light-Compact. Just the tool for getting into small, difficult places. Write today for full details and 10 day trial offer.

M-B PRODUCTS

126 E. Larned St. Detroit, Mich.

Binks Main Line Oil & Water Extractor

The Binks Manufacturing Company, 3114 Carroll Ave., Chicago, Ill., is offering a new oil and water extractor for installation on main air lines, to be known as the Binks No. 540.



Binks No. 540 Main Line Oil & Water Extractor Baffle Plates and Filter Core.

This extractor can be used with compressors of large capacity to ensure the delivery of clean air to spray painting jobs and other types of jobs requiring clean, cool air, absolutely free from oil, dirt, and water. The unit has a capacity up to 200 cu. ft. of air per minute. It is equipped with a 2-in. air inlet and a 2-in. air outlet. The heighth is 45½ in. and the overall diameter is 8⅜ in. A ⅜-in. drain cock enables the operator to drain all dirt, water, and oil collected in the settling chamber.

The extractor is ideal for installation on air lines which are exposed to variations in temperature due to the distance which the main air line must travel.

Chroprime Permits Color Finishing of Chromium

Chromium is notably difficult to lacquer or enamel; in fact, it is said that no known type of air-drying lacquer will adhere to it satisfactorily. However, by the use of a primer, recently developed by Maas and Walstein Company, lacquer and enamel manufacturers, Newark, New Jersey, chromium can be finished in any desired color.

The product, known as "Chroprime", is a clear primer which can be applied to the metal surface by spraying or dipping, after which it can be baked. It adheres tenaciously to the metal and provides an excellent foundation for any kind of lacquer enamel. It resists heat, remains flexible, and permits the metal to be engraved after it is applied. It is at present finding extensive application in the production of automobile nameplates and for other purposes where colors are wanted on a corrosion-proof base. Chroprime can also be used as a durable undercoat for finishing other metals.

M-B Super Speed Air Grinder

The illustration shows an air grinder which has been placed on the market by M-B Products, 126 E. Larned St., Detroit, Mich. The grinder is 5 in. long, weighs 8½ oz. and develops approximately 100,000 r.p.m., which makes the tool particularly adaptable for fine work on dies and tools.

The housing is of aluminum and the working parts are of a specially selected

Super Speed Air Grinder

high grade steel. All parts subject to wear are hardened and ground. The shaft revolves in high grade ball bearings of a well-known make. The grinder is so designed as to be self cleaning, thus preventing dust and abrasives from entering the bearing surfaces.

U. S. Royal Asbestos Cord Steam Hose

The U. S. Royal Asbestos Cord Steam Hose Official P-6031, an addition to its line of steam hose has been announced by U. S. Rubber Products, Inc., 1790 Broadway, New York. Despite the fact that "U. S." already has a super hose in its Matchless brand as well as other representative styles, demand indicates that there is a distinct place for an asbestos hose of this type.

Tests conducted chiefly in oil refineries where the new hose will find its most important uses, indicate that the U. S. Royal Asbestos Cord Steam Hose, with its non-deteriorating, non-char carcass, its adaption to super-heated high pressure steam service, its light weight and its flexibility will prove to be easy handling and highly serviceable.

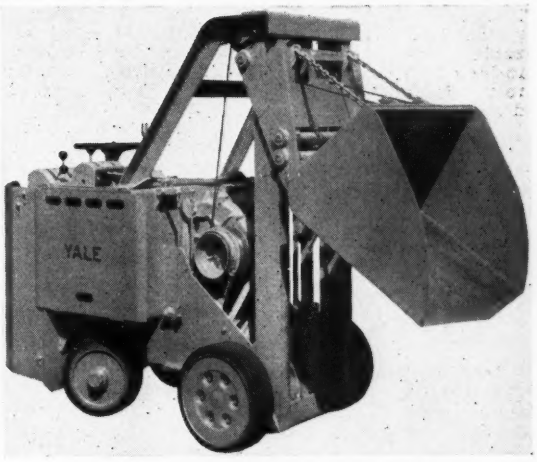
The hose is constructed of quality steam and heat-resisting rubber tube; four plies of high strength asbestos cords wound spirally in alternating directions; cords cushioned in a layer of rubber and wrapped in a heat-resisting rubber cover.

U. S. Royal Absestos Cord Steam Hose is made 4 ply in ½ in. ¾ in. 1 in. 1¼ in. and 1½ in. I. D. sizes, accommodating pressures ranging from 175 pounds to 200 pounds. Maximum lengths are 50 feet. For coupling either Samson High Pressure or Long Shank Steam Hose Couplings are recommended.

Yale Dumping Shovel Scoop Truck

To meet certain conditions in industry, the Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa., has brought out the Dumping Shovel Scoop Truck illustrated herewith. The truck is capable of shoveling into a pile of sand, glass batch, coal or other loose materials, picking up 10 to 15 cu. ft. at one shot for transportation to other points about the plant where the load can be elevated and dumped at any point, in keeping with operating requirements.

The design of this unit is such that



Yale Dumping Shovel Scoop Truck

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An Exclusive Winter Resort Hotel

it can be maneuvered in closely congested quarters. For example, it is capable of scooping up materials from the inside of a freight car for transportation to point of usage, with speed and great flexibility.

Bristol Belt Lacing. The Bristol Company, Mill Supply Division, Waterbury, Conn., announces the publication of a new folder, Bulletin No. 725, covering Bristol's Steel Belt Lacing. Prices, sizes, and so on are included for the various types of steel belt lacing manufactured by this company as well as information concerning the uses of the various types. A copy of the bulletin will be sent upon request.

Synthane Laminated Bakelite Tubing. The Synthane Corporation, Oaks, Pa., announces a 6-page general folder discussing the grades, physical, chemical, mechanical and electrical properties, shapes characteristics and standards of quality of Synthane Laminated Bakelite Tubing.

Interesting features of the folder are a two-color quick reference comparison chart of the test values of rolled and molded tubes, including the tensile, compressive (axial and radial) and dielectric strengths, moisture absorption, power factor and dielectric constant.

Those unfamiliar with the applications of laminated bakelite to chemical, mechanical, or electrical design or production problems will find this folder very helpful. Copy free upon request.

New Principle in Pyrometric Heat Control. A series of bulletins has been released by the Wheelco Instrument Co., 1112 Milwaukee Ave., Chicago, Ill., on the subject of Pyrometric Heat Control. In these bulletins, prepared by their technical engineers, the Wheelco Company presents an interesting and informative detailed analysis of their recently developed "Radio Principle" type of pyrometric control instruments. This "radio principle" is entirely new in its application and provides industrial engineers with a new answer to their heat control problems. The bulletins may be obtained direct from the Wheelco Company by any interested engineer or executive.

Loxal Metal Coating. The uses and advantages of Loxal Metal Coating are fully outlined in a four-page folder which is being issued by Hanson-Van Winkle-Munning Company, Matawan, N. J. The folder states that Loxal can best be applied by using an iron tank, equipped with heating coils, in which Loxal Powder is dissolved in hot water. Metal parts that are to be coated are dipped into the solution which leaves a thin coating that forms a bond with the surface of the metal, preventing rust. Copy free upon request.

How to Instruct. Sixteen pages, 5¼x7 inches in size. Edited by Glenn Gardiner and Chapin Hoskins. Published by Elliott Service Company, 242 W. 55th St., New York, N. Y. This book comprises a series of practical pointers for department heads, supervisors and foremen on the manner in which workmen should be instructed regarding their tasks. Each one of the four steps—(1) tell him, (2) show him, (3) test him, and (4) check him—is accorded a chapter of elaboration. Other chapters are "What to Teach", "Why Give Reasons Why", "Preparing the Learner for Instruction", "Preparation an Instructor Should Make", "Making the Right Impression", "What to Teach about Safety", "Putting Across Company Policies" and "Imparting Labor Policies". The booklets are intended to sell at ten cents each, with quantities at discount, but sample copies will be sent free to plant managers, general managers, work managers, or other directing heads.

Facts About Metal Polishing. Users of abrasives will be interested in this book which has just been issued by the Norton Company, Worcester, Mass. Among the subjects covered, as evidenced by the chapter headings, are: Physical Properties Required in Abrasive Grain; Preparation of Glue; Setting Up Polishing Wheels; Correct Drying; Polishing Different Metals. The book also includes a table of recommended grain sizes for various types and kinds of work. Copy free upon request.

Grits and Grinds. Volume 27, No. 5. This issue of "Grits and Grinds", published by the Norton Company, Worcester, Mass., is devoted to abrasives and their applications to modern production. Practically the entire 12 pages of the issue are devoted to photographs illustrating the use of abrasives, abrasive wheels and abrasive compounds, in modern maufacturing processes. Each illustration is accompanied by an explanatory caption. A copy of this number can be had by addressing the Norton Company at the above address.

Sprayed Molten Metal Coating Process. Metals Coating Company of America, 497 N. 3rd St., Philadelphia, Pa., is now distributing a six-page folder describing the operation of the "MetaLayeR" and the manner in which it sprays molten metal. The folder is No. 1206 and is titled "MetaLayeR, Complete Metal Coating Process. Interesting photographs of typical sprayed molten metal coatings, both for maintenance and production, as well as a complete description of the process and equipment are included Copy free upon request.

Ling-Belt Silent Chain Drive Data Book. The 1936 edition of Link-Belt Data Book No. 125, containing 96 pages of descriptive matter applying to Silverstreak Silent Chain Drives of fractional horse power up to 2000 h.p. has been completed by Link-Belt Company, 519 N. Holmes Ave., Indianapolis, Ind. The new data book is 8½x11-in page size and in its manner of presentation reflects the progress of approximately five years since the preceding edition of this book was published.

The book contains directions for simple efficiency tests which may be applied to present methods of power transmission in order to discover opportunities to cut production costs. Twelve simple check-ups are suggested and graphically portrayed. Plant engineers will value these two pages in particular.

The table of contents includes installation pictures, engineering data, recommended drive selection, lubrication and casings, dimensions of chains and parts, list prices of chains and wheels, dimensions of wheel rims, hub sizes, bores and keys, chain adjusters, breaking pin hubs, electrical data and so on. Copy free upon request.

K-C 1/3 H.P. Single Phase Motors. Kingston-Conley Electric Co., 60 Brook Ave., Plainfield, N. J., is now issuing a circular describing the 1/6, 1/4 and 1/3 h.p. single phase, split phase and three phase motors built by this firm. In addition to the illustrations, the circular describes the construction of the motor in detail, including a centrifugal starting switch, oversize ball bearings, ventilating system, line switch, and so on. Specifications and prices are included. Copy free upon request.

Century Single Phase Motors, in sizes from ⅛ to 40 h.p., are described in detail in an eight-page folder now being distributed by Century Electric Company, 1810 Pine St., St. Louis, Mo. Besides the descriptions and illustrations of the motors and their various parts, the bulletin presents data regarding advantages of the repulsion start induction brush lifting single phase motors. The characteristics of these motors are brought out and the advantages of the particular design used is explained in detail. Copy free upon request.

New Principle in Pyrometric Heat Control. A series of bulletins has been released by the Wheelco Instruments Co., 1112 Milwaukee Ave., Chicago, on the subject of Pyrometric Heat Control. In these bulletins, prepared by their technical engineers, the Wheelco Company present an interesting and informative detailed analysis of their recently developed "Radio Principle" type of Pyrometric Control instruments. This "Radio Principle" is entirely new in its application and provides industrial engineers with a new answer to their heat control problems. The booklets may be obtained direct from the Wheelco Company by any interested engineer or executive.

Armco Galvanized Paintgrip Sheets. A folder describing the advantages of Armco Galvanized Paintgrip Sheets has just been issued by The American Roll-

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$2.50
Single
WITH BATH

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ing Mill Company, Middletown, Ohio, under P. O. 73. Paintgrip is a new Armo galvanized sheet metal that is readily paintable without special acid treatments or weathering.

Forming qualities, soldering practice, welding, cleaning, and finishing operations are described in the folder. Paintgrip is available in base metals of Armco Ingot Iron, copper-bearing steel or plain steel. Copy free upon request.

Ajax Flexible Couplings. Ajax Flexible Coupling Co., Westfield, N. Y., is issuing a set of data sheets covering all standard couplings manufactured by this company and bound for the convenience of the engineer, draftsman or purchasing agent. Technical information covering details of construction are presented, together with blue prints showing the design and dimensions. Tables of specifications for each type of coupling are also given. Copy free upon request.

Industrial Wiring Survey. Continuous and abusive usage of the electrical systems in industrial plants has produced varying degrees of deterioration, obsolescence, hazardous conditions, and functional inefficiencies. Changes and plant additions also outgrow the capacity of existing wiring facilities to perform economically. Before these conditions can be corrected, however, it is necessary to ascertain the facts by planned investigation. To aid in making an adequate survey of existing conditions, Anaconda Wire and Cable Company, 25 Broadway, New York, N. Y., is distributing a set of forms and instructions which have been worked out to facilitate investigation of the condition of electrical equipment and wiring in industrial plants from the standpoint of the ability to carry load, surplus or space capacity, system defects, safety and obsolescence.

Instructions are included as to the logical procedure for making such a survey, convenient space is provided for recording findings and recommendations are given for plans or plot sketches of the existing layout. It is believed that such a study, faithfully followed through, will disclose the weaknesses—if any—in the electrical system and become a permanent record for determining what parts of the system may be extended under pressing conditions. Copies may be had by plant executives upon request.

Resinoid Wheels

(Continued From Page 31)

oid wheel has been determined to be approximately one hundred pounds although, in some cases, a pressure of one hundred and twenty pounds can be used effectively. This type of bonded wheel stands up under severe abuse, such as edge and corner grinding.

The factor of elasticity plays an important part in Resinoid bonded wheels. While the degree of elasticity is not as great in Resinoid wheels as in shellac and rubber bonded wheels, it is sufficient to permit the successful operation of wheels as thin as 3/64 in. The elastic feature, together with the mechanical strength, makes possible the use of Resinoid wheels for slotting and grooving where side strains are exerted or for use on portable sawing machines.

In the use of Resinoid wheels, a matter of first consideration is the care and maintenance of the machines on which they are mounted. Vibration is one of the most detrimental conditions which has to be contended with, particularly in the snagging field. To reduce the vibration on the snagging operation, it is necessary to have heavy, smooth-running machines of the ball bearing type and to bed the castings in sand so that a minimum of vibration will be set up. Vibration is often caused by loose or worn bearings and cases are known where the life of a wheel has been reduced 50 per cent due to the fact that the machine on which it was used was in poor condition.

Resinoid wheels can be made with either fused Alumina or green grit silicon carbide grains. Ordinarily, Aloxite brand resinoid bonded wheels are used for grinding material of high tensile strength while Carborundum brand Resinoid bonded wheels are used for grinding materials of low tensile strength. Resinoid bonded wheels are made in all grits from 12 to 400 in a variety of grades.